

Commercial Fisheries Abstracts

a monthly summary of important developments
for the fishery industries

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FISH & WILDLIFE SERVICE

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Commercial Fisheries Abstracts



DIVISION OF INDUSTRIAL RESEARCH AND SERVICES BUREAU OF COMMERCIAL FISHERIES

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

- | | | |
|---------------------------|----------------------|----------------------|
| 0 General and theoretical | 3 Preserved fish | 7 Analytical Methods |
| 1 Fish by species | 4 Oils | 8 Composition |
| 2 Fresh fish | 5 Vitamins | 9 Miscellaneous |
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0. 38 THE ENZYME 5--PHOSPHORYLRIBOSE PYROPHOSPHOKINASE IN FISH MUSCLE Tarr, H. L. A. (Fisheries Research Board of Canada, Technological Station, Vancouver, British Columbia) Canadian Journal of Biochemistry and Physiology 38, 683-691 (July 1960) Introduction. -- Kornberg et al. (1954) were the first to report the isolation of 5-phosphoryl α-D-ribose 1-pyrophosphate, and they subsequently gave a more detailed account of its enzyme synthesis from adenosine triphosphate and D-ribose 5-phosphate by a pigeon liver enzyme (Kornberg et al. 1955). In independent studies, which were largely concerned with the biosynthesis of purines, Korn et al. (1955) and Remy et al. (1955) isolated the same compound and showed that the pyrophosphate group was in the α position. Tener and Khorana (1958) showed that the enzymic synthesis of 5-phosphoryl α-D-ribose 1-pyrophosphate involved a direct transfer of the terminal pyrophosphate group of adenosine triphosphate to carbon 1 of D-ribose 5-phosphate. The pivotal role of 5-phosphoryl α-D-ribose 1-pyrophosphate in the biosynthesis of purine and pyrimidine nucleotides was reviewed by Carter (1956) and more recently by Hartman and Buchanan (1959). The last-named investigators described the complex series of enzymic processes which are involved in the de novo synthesis of inosinic acid from D-ribose 5-phosphate and adenosine triphosphate via 5-phosphoryl α-D-ribose 1-pyrophosphate and other intermediates. Experimental. -- Freshly excised muscle, from fish obtained at sea, was placed into polyethylene bags and frozen on contact with dry ice. Live lingcod (<i>Ophiodon elongatus</i>) were stunned and the muscle and organs were promptly excised, frozen in liquid nitrogen, and, unless otherwise stated, stored at -50°C. in polyethylene bags. The distribution of 5-phosphorylribose pyrophosphokinase in different tissues or organs of fish was determined by blending a portion of tissue with 2 volumes of (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	2. 1121 IMPROVEMENTS TO THE DEEP SEA TRAWL Garner, John World Fishing 9, 24-26 (July 1960) Because the Granton trawl is of ideal size for present day trawling, it is thought that an increase in the height of the head-rope would be more beneficial to its efficiency than an increase in size. By comparing the drawings of the current and improved Granton trawl, it can be seen that few alterations have been made. The only slight differences are in: (a) the square, which alters shape a little and becomes forty meshes broader at the head; (b) in the lower wings, which do not decrease in width quite so rapidly as they do in the existing specification; (c) in the top wing where the greatest change takes place. It is here that the forty meshes increased in the square are absorbed (20 meshes in each wing) which leaves the top bosom unchanged; and (d) the bellies and lengtheners are made as one to give superior taper. Two methods of dan leno assembly exist. In the two-leg method, which is probably the best, the quarter ropes would have to be about 30 feet long instead of 10 feet. In the three-leg method, the legs would only be slightly longer than normal. (See drawings, over). Theoretically, it has been estimated that the above variations would increase the spread by a minimum of 12 percent and the vertical mouth opening by more than 7 percent. See illustrations, over. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
0. 5 NUTRITION AND METABOLISM OF MARINE BACTERIA IX. ION REQUIREMENTS FOR OBTAINING AND STABILIZING ISOCITRIC DEHYDROGENASE FROM A MARINE BACTERIUM MacLeod, Robert A.; Hori, Aiko; and Fox, Sylvia M. Canadian Journal of Biochemistry and Physiology 38, 693-701 (July 1960) Introduction. -- In the course of an investigation to determine if enzymes of the tricarboxylic acid cycle were present in a marine bacterium, cells of the organism were routinely washed and suspended in a solution of $MgCl_2$ for the preparation of extracts by ionic treatment. A solution of $MgCl_2$ was the medium of choice for washing the cells since Mg^{++} prevented cell lysis, and the enzymes in the prepared extracts were to be tested for their response to Na^+ and K^+. All of the enzymes of the tricarboxylic acid cycle could be shown to be present in the extracts except isocitric dehydrogenase. Since citrate-adapted whole cells of the organism had been found to oxidize citric acid with the accumulation of large amounts of α-ketoglutaric acid it seemed likely that isocitric dehydrogenase was present in the intact cells. Conditions were therefore sought for the demonstration of its presence in the cell-free extract. These studies have indicated that rather specific inorganic requirements must be met before an active isocitric dehydrogenase can be demonstrated routinely and its activity maintained. Experimental. -- The organism used is a species of either a <i>Pseudomonas</i> or a <i>Spirillum</i>, and it has been designated as B-16 in this and previous communications. Conditions for carrying the cultures, growing the cells, and preparing the cell suspensions have been described by MacLeod and Hori (1960). Results. -- When cells of a marine bacterium were washed and suspended in 0.05M $MgCl_2$, isocitric dehydrogenase could not be demonstrated in the prepared extract, although all other enzymes Reprinted in part COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	2. 15 PROCESSING AND QUALITY STUDIES OF SHRIMP HELD IN REFRIGERATED SEA WATER AND ICE PART 4 - INTERCHANGE OF THE COMPONENTS IN THE SHRIMP-REFRIGERATED-SEA-WATER SYSTEM Collins, Jeff Commercial Fisheries Review 22, 9-14 (July 1960) The author and his coworkers previously had observed an apparent loss in solids from peeled shrimp meats held in ice and in refrigerated sea water. It was not known whether this apparent loss of solids was caused by leaching of the soluble constituents or by the uptake of water by the shrimp tissues. The primary purpose of the study reported here was to resolve this uncertainty and the secondary purpose was to more fully characterize the various changes that occur in the shrimp-brine system. To accomplish these aims, a study was made of the balance between water, solids, ash, and salt contained in the brine, the whole shrimp, the peeling waste, the peeled raw shrimp meat, and the cooked, peeled shrimp meats. Experimental. -- The general experimental approach was (1) to hold pink shrimp in refrigerated sea water at 30°F. for periods up to 11 days, (2) to determine any change in weight of the whole shrimp, its components or the brine, and (3) to determine the moisture, ash, salt, and solids content of the components of the shrimp-brine system as a function of holding time. Results. -- 1. The whole shrimp absorbed water and salt, the rate of absorption being most rapid in the first few days, and lost corrected ash and solids, the rate of this loss also was rapid at first. The result of these two opposing tendencies was a net gain in weight for the whole shrimp. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

involved in the tricarboxylic acid cycle had been shown to be present. Failure to detect the enzyme was traced to the presence of halide as the sole anion in the solution that was used to suspend the cells. Sulphate or phosphate salts gave rise to an active enzyme. These relations applied to extracts prepared by ionic treatment, alumina grinding, and lysis by versene and lysozyme. Evidence that was obtained suggested that halides fail to prevent the denaturation of the enzyme after its release from the cells. Under optimum conditions, the specific activity of isocitric dehydrogenase in the extract was found to be proportional to the ionic strength of the solution used to suspend the cells (maximum activity occurred at 0.4 to 0.5M). In the presence of low concentrations of an anion that gave rise to an active enzyme, halide salts were found capable of contributing to the ionic-strength requirements of the enzyme. The addition of Mg^{++} to the extract in the presence of a suitable anion at least doubled the storage life of the enzyme at 4°C.

water at 0°C. for about one-half minute and centrifuging at 10,000 times gravity for 5 minutes. The clear extracts were tested by adjusting them to between pH 7.4 and 7.5 and by incubating 0.33 ml. of extract in a total volume of 1.0 ml. with adenosine triphosphate and D-ribose 5-phosphate exactly as in the assay B, stage 1, procedure of Kornberg et al. (1955). 5-Phosphoryl α -D-ribofuranose 1-pyrophosphate formation was normally linear for up to 6 hours at 30°C. under these conditions.

Results.—Tests with a number of aqueous tissue extracts indicated that, apart from spleen and milk, only the muscle showed considerable enzyme activity. The lability of the enzyme system in the muscle and crude extracts is apparent since the activity of preparations obtained by freezing the muscle in dry ice at sea was invariably lower than that obtained with muscle frozen promptly in liquid nitrogen. Storage of the muscle, or of aqueous extracts prepared from it, at -25°C. caused slow loss in activity. Inactivation was extremely rapid in extracts held at 1°C., whereas the crude muscle extracts lost little activity when partially concentrated by freeze-drying.

Available techniques for purification of the enzyme were limited by its lability; however, the enzyme was considerably purified at between 0° and -1°C. by a simple, rapid procedure which involved extraction of the muscle with water, precipitation of the active fraction at pH 5.5, resolution of the precipitate in 0.1M phosphate buffer pH 7.0, and removal of about one-half of the inactive protein from the solution by treatment with alumina C₁₈ gel. The enzyme was found to be very unstable in that purified preparations lost activity quite rapidly even when stored at less than -50°C. The pH activity of the enzyme and its requirement for adenosine triphosphate, D-ribose 5-phosphate, Mg^{++} , and glutathione were included as a part of this study. In addition the lithium salt of 5-phosphoryl α -D-ribofuranose 1-pyrophosphate was prepared in good yield and in a comparatively high state of purity from purified muscle enzyme from lingcod.

2. The brine reflected a reverse change from the whole shrimp; that is, water and salt were lost, and corrected ash and solids were gained, with the net change in weight of the brine being a loss.

3. The pattern of changes taking place in both the raw, peeled shrimp and the peeling waste was similar to that for the whole shrimp.

4. Over the 11-day period, the precooked meats showed a gain in salt content but a loss in corrected ash, solids, and even water; the result was a net loss in weight. As a function of holding time, the precooked meats had a greater rate of loss of solids than did the raw meats. This observation indicates that the holding period resulted in a change in the raw meats so that the solid material became more soluble during the precook.

5. Assuming that the loss in solids, as defined in this experiment (total weight of precooked shrimp minus weight of water, salt, and corrected ash), is related to the yield of commercially processed shrimp, a processor will suffer a loss of more than 2 cases per 100 for each day the shrimp are held over the minimum time of 2 days required for proper machine peeling.

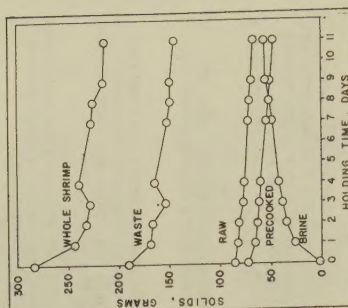
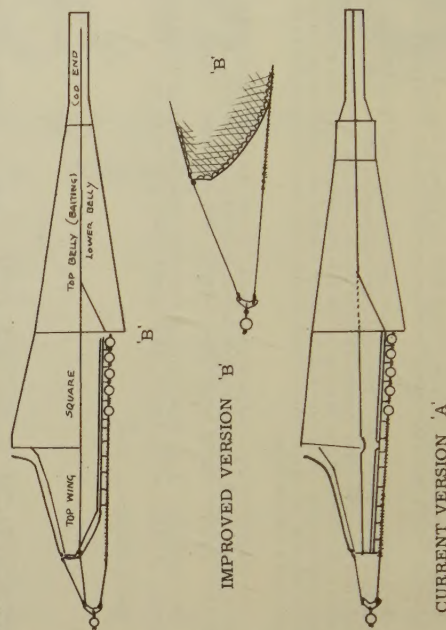


Figure 4.--The solids content of the various components of the shrimp-brine system as affected by the holding time in refrigerated sea water.



Sketches showing differences between the current Granton trawl and that with suggested improvements.

2. 15 SEATTLE CANNERY TENDER INSTALLS CHILLED SEA WATER SYSTEM

Anonymous
Fish Boat 5, 27-28, 46 (September 1960)

A subject now being discussed widely by members of the fishing industry is the use of refrigerated sea-water systems. Boat owners wish to know how difficult the systems are to install, how they operate and how successful they are at maintaining fish quality.

A recent report from Seattle on the installation and practical application of a refrigerated sea-water system on a cannery tender helps to answer these questions. The specific installation referred to in this article is unique in that salt-water-resistant aluminum alloy was used to construct the tanks.

The accompanying drawing (see over) shows all of the components of the refrigerating system installed on the cannery tender.

Essentially, the refrigerant cycle may be described as follows: The ammonia gas enters the compressor, emerges at 150 pounds pressure, is cleaned of lubricating oil by the oil trap, then enters the condenser. In the condenser it is liquefied and goes into the receiver. It leaves the receiver, still under 150 pounds pressure, and passes into the thermostatic expansion valve where the pressure goes down to 35 pounds and the temperature drops to 22 degrees. The ammonia evaporates as it is passed through the chiller, absorbs heat from the sea water, and is then returned to the compressor.

See illustration, over.

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

ABSTRACTER: Kathryn L. Osterhaug

2. 9 APPLICATION OF THE PARALYTIC SHELLFISH POISON ASSAY TO POISONOUS FISHES

McFarren, E. F. and Bartsch, A. F. (Robert A. Taft, Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio)
Journal of the Association of Official Agriculture Chemists 43, 548-554 (August 1960)

Introduction. -- At the request of the Department of the Interior, which administers the Trust Territory of the Pacific Islands for the United Nations, the Department of Health, Education, and Welfare sent three scientists to the Marshall Islands in the spring of 1958 to investigate an alleged increase in fish poisoning among persons living there. Laboratory equipment and white mice to be used for bioassays were transported to the base of operations at the Marshall Islands Memorial Hospital on Uliga Island, Majuro Atoll. Most of the fish specimens taken at Majuro were tested there; however, a few along with others from Jalut Atoll were shipped frozen to the Robert A. Taft Sanitary Engineering Center at Cincinnati, Ohio, for further study.

A report of the survey findings has been published elsewhere by Bartsch et al. (1959). This paper describes additional studies seeking to develop more specific methods of assaying for the fish poisons. Halstead (1958) has indicated that there may be as many as eight different kinds of fish poison, but that lack of specific assay methods makes it difficult to determine whether all actually are chemically different. Evidence that two of them differ chemically from each other and from paralytic shellfish poison is presented here, together with more specific assay methods for these two fish poisons.

Puffer fish poison can be assayed in much the same manner as shellfish poison by preparing an acid extract of the tissue and injecting this extract into mice. However, the dose-death-time response

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ABSTRACTER: Martin Heerdt

CHILLED SEA WATER SYSTEM

ASSAY FOR FISH POISONS

2. 9

NUTRITIVE VALUE OF FISH, II, BIOTIN, FOLIC ACID, PANTOTHENIC ACID, AND FREE AMINO ACIDS OF VARIOUS SALT-WATER SPECIES

Loughlin, M. E. and Teeri, A. E. (University of New Hampshire, Durham)
Food Research 25, 479-483 (July-August 1960)

Introduction and experimental. -- In a previous report by Teeri et al. (1957), information concerning the nicotinic acid, riboflavin, vitamin B₁₂, and protein amino acids of various salt-water species commonly consumed in New England and other areas was presented. Similar information with respect to biotin, folic acid, pantothenic acid, and free amino acids is reported herein. Market-fresh samples of various species of fish, including shellfish that are commonly consumed in New England, were analyzed quantitatively for biotin, folic acid, and pantothenic acid, and qualitatively for free amino acids. Some canned samples were also analyzed. Edible portions of fish muscle were blended and extracted as previously described. Vitamin analyses were carried out by standard quantitative microbiological procedure (Difco Laboratories 1953) using *Lactobacillus arabinosus* 17-5 (A, T, C, C, No. 8014) for biotin and pantothenic acid, and *Streptococcus lactis* R. (A, T, C, C, No. 8043) for folic acid.

To determine the free amino acids occurring in the tissue, a portion of blended fish was successively extracted with water by the use of a centrifuge; and the water extracts were combined and concentrated by heating. The insoluble protein, which separated out, was removed by centrifuging. Traces of protein that remained were removed with lead acetate. The resulting extract was adjusted to a definite volume, and aliquots of it were subjected to one- and two-dimensional chromatography. Other aliquots were subjected to hydrolysis by refluxing at 100°C. for 24 hours in a final concentration of 1 to 1 HCl. The excess HCl was removed with Amberlite IR-4B (OH). The solution was concentrated; the volume was adjusted; and aliquots were chromatographed by methods previously reported. Insofar as possible, the chromatographic spots were identified by their location and by their reactions to various tests.

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ABSTRACTER: Martin Heerdt

3. 24 HANDLING AND STORAGE OF QUICK-FROZEN FOODS

Benefield, H. E.
The Refrigeration Journal 12, 35 (Jan 1959)
World Fisheries Abstracts 10, 25-26 (September-October 1959)

It is generally agreed that 0°F. (-17.8°C.) should be the maximum temperature for the commercial storage of quick-frozen foods, except fish, particularly those whose production season occurs only once in every 12 months, thus requiring the full 12 months' storage.

In general, commercial storage temperatures required are between 0° to -10°F. (-17.8° to -23.3°C.) depending upon the product and the commercial circumstances involved. The deterioration which occurs due to rises in storage temperature are loss of flavor, the occurrence of off-flavors, deterioration in color and loss of vitamin C and some nutritive values. Technically, if temperatures of -20° to -25°F. (-28.9° to -31.7°C.) were maintained the storage life for most products would be lengthened considerably.

Gross temperature variation can change the ice crystal structure in the product and cause migration of moisture from one ice crystal to the other, increasing the size of ice crystals in the product which in turn causes flavor changes and texture changes.

Minor temperature variations can also, in some circumstances, change the crystal structure and it is the generally accepted practice that variations in temperature should be kept to a minimum. The major effect of temperature variation on the product is, however, loss of moisture by dehydration caused by changes in relative humidity which also causes condensation on the coils. Commercial consideration may make it necessary to increase the range of maximum variation to not more than 3°F. (1.7°C.).

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Reprinted in whole

B-VITAMIN VALUE OF FISH

STORAGE OF QUICK-FROZEN FOODS

2.9

for puffer fish poison is not the same as for shellfish poison. An LD₅₀ of puffer fish poison produces an average death time of 30 minutes, rather than of 15 minutes for that of shellfish poison. Puffer fish poison is relatively insoluble in water at neutral pH but is readily soluble at a pH of 4.0 or less and, within limits, the toxicity of acid solutions increases with decreasing pH. As with shellfish poison, salt has an attenuating effect when mice are injected intraperitoneally with the puffer poison.

For accurate results when assaying for puffer fish poison, a correction factor should be applied for mice weighing other than 20 grams. Mice over 23 grams should not be used. Mice respond to the poison in a crude acid extract most demonstrably in the death-time range of 20 to 25 minutes; if dilutions are adjusted to this range, the poison also can be distinguished from paralytic shellfish poison.

The characteristics of snapper fish poison appear identical to those reported for poison in barracuda, *Sphyræna plicuda*. The poison is, however, different from paralytic shellfish poison and puffer poison. Snapper poison is characterized by its solubility in fat solvents and by a different mode of action in cats and mice. Also, it cannot be assayed by injecting an acid extract into mice unless it is present in very high concentration. It can be assayed by intraperitoneal injection of mice provided the fish tissues are extracted with ethyl ether and the resulting extract is concentrated to an oily residue. In addition to ether solubility, it is soluble in ethanol and acetone; however, from limited tests it appears to be only slightly soluble in methanol. These preliminary observations indicate that an LD₅₀ of this poison in the crude ether extract will produce an average death time of about 1 hour.

3.24

For correct storage and handling of quick-frozen foods, the major requirements are: (1) refrigeration machinery and room insulation should be capable of holding the temperature of the products at 0°F. (-17.8°C.) or below, with no more than 3°F. variation; (2) the temperature split between coil temperature and room temperature should be kept to a minimum; for this reason, coiled rooms are preferred to circulation; (3) air movement should be allowed around the product stacked in the rooms; the product should be stacked on dunnage 6 inches (15.2 cm.) above the floor, 4x6 inches (10.2 to 15.2 cm.) from the walls and 15 inches (38.1 cm.) from the roof; the product should also be kept clear of doorways, lift wells, et cetera, where there can be relatively warm spots in the room.

Handling. --(1) Transport facilities should be able to maintain 0°F. temperatures in transit; (2) loading and unloading facilities both from the transport and into the cool storage should be mechanized, if possible, or should be organized in such a fashion that there is a minimum exposure of the product to atmospheric temperature; (3) the product should be stacked in such a fashion that adequate air circulation is attained in order to reduce the surface temperature of the cases that have been exposed to atmospheric temperatures; and (4) there should be an adequate system of supervision and temperature checks at all points along the transit line to ensure that specifications have been adhered to.

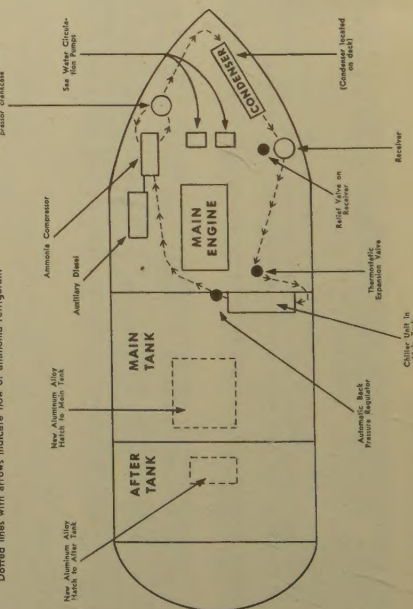
2.15

LAYOUT AND COMPONENTS OF THE SYSTEM

Sketch of refrigeration installation on THEO E.

Dotted lines with arrows indicate flow of ammonia refrigerant

Oil temperature/light, heavy compressor, pressure, etc.



2.9

Results. --Average results of the biotin, folic acid, and pantothenic acid analyses are tabulated below. The prominent free amino acids found in water extracts of fish muscle were glutamic acid, glycine, alanine, taurine, valine, and leucine; whereas in water extracts of shellfish muscle the prominent free amino acids were glutamic acid, glycine, taurine, alanine, valine, leucine, arginine, and proline.

Species	Average B vitamin content of various species (fresh weight basis) 1/		
	Biotin MHH-Mcg./g.	Folic acid MHH-Mcg./g.	Pantothenic acid 2/ Mcg./g.
Cod	1.89	17.5	1.22
Cusk	1.17	19.8	1.15
Haddock	2.93	8.13	1.40
Haddock roe	122.8	637.	36.2
Halibut	18.9	19.5	2.99
Mackerel	15.0	12.4	4.64
Salmon	8.52	21.5	7.45
Smelts	30.3	36.6	6.38
Swordfish	1.61	20.4	2.03
Clams	23.4	26.5	6.22
Oysters	7.23	37.0	1.84
Scallops	3.16	5.08	1.43
Lobster (claw)	51.8	5.48	19.9
Lobster (tail)	47.9	5.63	12.7
Shrimp	10.1	73.8	3.72
Crab	46.0	3.0	4.9
Salmon	14.8	6.7	5.7
Tuna	4.5	32.5	2.0

1/ Each figure represents 6 to 15 samples.

2/ Calculated as calcium pantothenate.

2. 9 CLAM POISON. I. THE PAPER CHROMATOGRAPHIC PURIFICATION OF CLAM POISON DIHYDROCHLORIDE

Casselman, A. A.; Greenhalgh, R.; Brownell, H. H.; and Bannard, R. A. B. Canadian Journal of Chemistry 38, 1277-1290 (August 1960)

Introduction. -- Mold and coworkers (1957) recently described the criteria for the purity of clam poison dihydrochloride, the paralytic poison that can be isolated from the siphon of the toxic Alaska butter clam, *Saxidomus giganteus*. Paper chromatography of clam poison dihydrochloride, in several solvent systems, showed only one typical pink spot with Weber reagent (Rf 0.30) when phenol-water (4 to 1) or t-butanol-acetic acid-water (2 to 1 to 1) was used as developer.

Partially purified clam poison, which had a toxicity of 4150 mouse units per mg. of clam poison, was used for structural investigation. Paper chromatograms revealed that the sample contained at least five components, and it soon became evident that further purification was necessary. Because of the small quantity of clam poison available for study, the method of purification used by Schantz et al. (1957), the final step of which required chromatography on acid-washed alumina, was considered too wasteful owing to 25- to 45-percent recovery of the material of high toxicity.

Prior to beginning degradative studies, the authors decided to develop a semimicro method that would be applicable to reaction mixtures from clam poison. This method would make feasible both the isolation of the desired products and the recovery of any unreacted toxin in a high state of purity. In addition, the authors desired to examine the feasibility of paper chromatography as a means of purifying clam poison residues of low toxicity, which had not responded to a variety of chromatographic methods designed to enhance toxicity.

Purposes. -- The work outlined in this paper describes the development of a paper-chromatographic (over)

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ABSTRACTER: Martin Heerd

3. 19 IRRADIATION PRESERVATION OF PACIFIC NORTHWEST FISH: PRECOOKED FISH STICKS

Miyauchi, David T. (Technological Laboratory, Bureau of Commercial Fisheries, Seattle, Washington) Food Technology 14, 411 (August 1960)

In a study to determine the storage life of precooked breaded fish sticks irradiated at various doses up to 2.0 megarads, two temperatures--room temperature and 35°F.--were chosen. For room temperature storage, the fish sticks were packed in hermetically sealed cans and irradiated at 1.0 and 2.0 megarads. For 35°F. storage, the fish sticks were packed either in mylar-polyethylene pouches or in hermetically sealed cans and irradiated at 0.25, 0.5, 1.0, and 2.0 megarads. These doses are well below the generally accepted sterilization level of 4.8 megarads.

The storage characteristics at room temperature of the 1.0- and 2.0-megarad fish sticks were poor. The storage life at 35°F. of the irradiated fish sticks packed in cans was about 8 to 12 weeks, but the irradiated fish sticks were only fair in organoleptic quality throughout most of their storage life because a musty odor developed and the white meat darkened.

The storage life at 35°F. of fish sticks irradiated at 0.5, 1.0, and 2.0 megarads appeared to be equal for those packed in mylar-polyethylene pouches and those packed in hermetically sealed cans. The storage life of the 0- and 0.25-megarad samples was less for those packed in mylar-polyethylene pouches than for those packed in cans.

The bacteriological history of fish sticks packed in the mylar-polyethylene pouches and stored at 35°F. is shown in table 1 (see over); that of fish sticks packed in No. 2 cans and stored at 35°F. is presented in table 2 (see over).

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ABSTRACTER: David T. Miyauchi

CHROMATOGRAPHIC PURIFICATION OF CLAM POISON

IRRADIATED FISH STICKS

3. 19 IRRADIATION PRESERVATION OF PACIFIC NORTHWEST FISH.

I. COD FILLETS

Miyauchi, David T. (Technological Laboratory, Bureau of Commercial Fisheries, Seattle, Washington) Food Technology 14, 379-382 (August 1960)

Introduction. -- Groninger and coworkers (1956) reported that irradiated halibut did not show any color, texture, or large odor changes, although the irradiated fish were significantly different in flavor from the controls. They found, however, that irradiated salmon were significantly different from the controls in both flavor and color. These studies included only limited information on the storage characteristics of irradiated fishery products. The present study was made to determine the effect of varying doses of ionizing radiation on the palatability and storage characteristics of raw filets of Pacific cod (*Gadus macrocephalus*) held at refrigeration temperatures above freezing.

Experimental. -- Cod filelets were selected directly from a commercial filleting line, packed in C-enameled cans, hermetically sealed without vacuum, placed in insulated shipping containers with wet ice, and shipped by air freight to the Materials Testing Reactor Gamma Irradiation Facilities at Idaho Falls, Idaho. Samples were irradiated at 0, 0.23, 0.46, 0.7, 0.93, 1.4, and 1.86 megarads for the screening test to determine their organoleptic acceptability and at 0, 0.1, 0.2, 0.23, 0.46, and 0.7 megarad for storage tests. All samples were packed in wet ice and returned by air freight. Some of both the unirradiated control samples and the irradiated samples were frozen and stored at -20°F. for use as reference samples during the storage tests. The other samples were used immediately for the organoleptic screening tests or were placed at refrigeration temperature above freezing for use as storage samples.

Quality changes induced by radiation treatment or that occurred during subsequent storage at refrigerated temperatures were determined by organoleptic, chemical, and bacteriological tests.

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COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 5
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

ABSTRACTER: Martin Heerd

3. 25 RATING THE COOLING LOAD

Achenbach, P. R.; Phillips, C. W.; and Goddard, W. F. (Air Conditioning, Heating and Refrigeration Section, National Bureau of Standards) ASHRAE Journal 2, 45-50 (May 1960)

Findings. -- Cooling loads of four empty commercial trailers ranged from 7,500 to 10,300 B. t. u. per hr. under laboratory test conditions of 100°F. ambient temperature, 50 percent ambient relative humidity, and 0°F. cargo-space temperature.

Extrapolation of the observed test results on the road indicated that the cooling loads under the laboratory conditions of temperature and humidity, but at a road speed of 50 m. p. h., would be from 10 to 27 percent greater than those observed in the laboratory, principally as a result of air leakage into and through the body construction under influence of the ram air pressure on the front of the trailer.

A small part of the increase in cooling load on the road was caused by solar radiation and the movement of engine heat under the floor of the trailer. The effect of solar radiation on the cooling load of the trailers was largely nullified by the rapid air motion over the vehicle at a road speed of 50 m. p. h.

The minimum computed air-leakage rates for the four commercial trailers, at a road speed of 50 m. p. h., were 1,475, 860, 790, and 660 cu. ft./hr., assuming that the leakage air left the trailer saturated at 0°F. The corresponding computed heat gains due to air leakage at ambient conditions of 100°F. and 50 percent R. H. would be 5,000, 2,900, 2,690, and 2,260 B. t. u./hr., respectively. On this basis, the cooling load due to air leakage ranged from 27 to 70 percent of the heat transmission component of the total cooling load at a road speed of 50 m. p. h. under design test conditions. These

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IRRADIATED COD FILLETS

TRAILER REFRIGERATION

The results of this study, though negative, are worthy of record since they indicate the limitations of low level irradiation of precooked fish sticks.

Table 1. -- Bacteria counts on irradiated precooked breaded fish sticks packed in mylar-polyethylene pouch and stored at 35°F.

Time of storage Weeks	0 megarad		0.25 megarad		1.0 megarad	
	Aerobic Bacteria/g.	Anaerobic Bacteria/g.	Aerobic Bacteria/g.	Anaerobic Bacteria/g.	Aerobic Bacteria/g.	Anaerobic Bacteria/g.
0	250	20	30	30	<10	<10
2	31,000	4,000	...	...	30	<10
6	1,000	1,000	...	...	<10	<10
8	28,000	13,000	1,000	1,000	...	...
10	670,000	24,000	170,000	9,000	<10	<10
14	920,000	12,000	3,000	1,000	<10	<10

Table 2. -- Bacteria counts on irradiated precooked breaded fish sticks packed in No. 2 cans and stored at 35°F.

Time of storage Weeks	0.25 megarad		0.5 megarad		1.0 megarad	
	Aerobic Bacteria/g.	Anaerobic Bacteria/g.	Aerobic Bacteria/g.	Anaerobic Bacteria/g.	Aerobic Bacteria/g.	Anaerobic Bacteria/g.
0	6.8x10 ⁵	2x10 ⁵	250	20	<10	<10
4	1.6x10 ⁸	...	1.4x10 ⁵	...	<10	...
6	...	...	1,000	1,000	...	...
8	...	...	1,400	300	<10	<10
12	...	...	16,000	1,000	130	<10
16	...	...	...	...	<10	<10

* Samples lost by error.

method of purification and its application (a) to the recovery and further investigation of the components contained in the partially purified sample of toxin furnished by Schantz et al. (1957) and (b) to the enrichment of clam poison residues of low toxicity.

Experimental. -- Topics studied were (1) paper chromatography of clam poison dihydrochloride, (2) procedure for pretreatment of papers, (3) blank runs on pretreated papers, (4) purification of clam poison dihydrochloride, (5) attempted reconversion of component 4 to clam poison dihydrochloride, (6) isolation of substance X and attempted reconversion to clam poison dihydrochloride, (7) purification of clam poison residues of low toxicity, (8) chromatographic behavior of clam poison acetate, and (9) potentiometric titration of clam poison acetate.

Results. -- A semimicro (10 to 25 mg.) paper-chromatographic method for purification of clam poison was developed. This procedure when applied to a partially purified sample of the toxin, which had a toxicity of 4150 mouse units per mg., enabled the authors to recover 74 percent of the available clam poison dihydrochloride. The purity of the recovered clam poison dihydrochloride was identical with that of the best material obtained by Schantz et al. (1957) by the use of an alumina chromatographic method. The upper limit of purity of toxin obtained by paper chromatography is estimated to be 98 percent because of traces of impurity introduced by the paper. The paper chromatographic procedure can be used to enrich low-grade toxic residues of 35-percent purity, which were obtained from the alumina process, to a purity of 75 percent with an over-all recovery of 70 percent of the toxin.

percentages indicate the significant reductions possible in heat gain by eliminating air leakage in trailer bodies.

Air leakage and ice accumulation in the trailers were not negligible even under stationary conditions. The air leakage amounted to 710, 230, 390, and 380 cu. ft./hr. and the ice-accumulation rates averaged 0.96, 0.32, 0.94, and 0.52 lb./hr., respectively, during the laboratory tests. There was probably several times as much air exchange between the insulation space and the outdoors as between the cargo space and outdoors.

The under sides of the trailers were heated as much as 15°F. above ambient temperature in some cases during road operation, principally by waste heat from the tractor engines. This rise could significantly affect the preservation of food on the interior floors of the trailers, if chilled air were not circulated around and under the load.

Without wind effects, ram air pressures up to 1.25 in. H₂O will occur on the front end of a trailer at a road speed of 50 m.p.h. on the portions unshielded by the tractor, although the average ram pressure will probably be below this value. The static pressures in the cargo space, in the insulation space, and over most of the exterior surface (excluding the front end and part of the roof) were about equal and ranged from 0.2 to 0.4 in. H₂O below atmospheric pressure for road speeds of 50 m.p.h. The leakage air probably entered the trailer body primarily at the front end of the trailer and left the body over the remainder of the surface, during still weather, leaving most of the moisture in the ambient air deposited as ice in the insulation space. Wind could alter the air movement pattern through a moving trailer and change the pressure pattern on the exterior considerably.

Results indicate that smaller refrigerating units could be used if air leakage is eliminated, or alternately, less insulation might be required if air leakage were significantly reduced. It is also probable that the deterioration of trailer bodies would proceed more slowly if moisture could be kept out of the insulation spaces.

A practical laboratory testing and rating method for refrigerated trailers can be established based on the heat-sink method for evaluation of the cooling load, modified to simulate the air leakage occurring during normal operation of the vehicle on the road. The pressurization of the front end of a trailer by means of an attached plenum is considered to be the most practical and representative simulation of the effects of the ram air pressure for use in a stationary laboratory test.

Chemical tests included determinations for total volatile base, total volatile acid, and trimethylamine. Duplicate plate cultures were made with tryptone-glucose-yeast extract agar and counted after incubating the cultures at 30°C. for 5 days.

Results and discussion. -- The taste panel could not consistently distinguish between the 0.23-, 0.46-, and 0.7-megarad samples. In general, these samples had a slight radiation (burnt or scorched) odor and flavor, which varied in intensity as much within samples of any one dosage level as between samples of different dosage levels. The 0.93-megarad samples had a slight radiation odor and a slight-to-moderate radiation flavor and were judged to be on the borderline of acceptability. The 1.4- and 1.86-megarad samples had moderately strong radiation odors and flavors and were judged unacceptable. On the basis of these results, 0.7 megarad was selected as the maximum dose for irradiating cod filets for the storage-life studies.

The control samples (no irradiation) had a storage life of 1 to 2 weeks. All of the irradiated samples were of good, acceptable quality for more than 3 but less than 6 weeks; however, they were on the borderline of acceptability for as long as 9 or 12 weeks.

Since irradiation produces a marked reduction in the number of micro-organisms and alters the surviving microflora population on cod filets, the spoilage pattern apparently is changed. The chemical freshness tests therefore did not correlate well with the organoleptic evaluation and did not appear to be a reliable index of quality. For samples irradiated at the same dose level, however, values for the chemical tests and plate counts generally increased with the time of storage. Total plate counts, including those determined on other samples but not reported here, were too inconsistent to be used as a reliable index of quality.

3, 23 NICHIRO ENTERS OYSTER INDUSTRY WITH WORLD'S MOST MODERN PLANT Anonymous Pacific Fisherman 58, 9, 11, 13-15 (September 1960) An oyster plant that went into preliminary operation in Hiroshima, Japan, in the late spring of 1960, has been rated as the finest and most modern oyster-packing plant in the world. The installation is a newly built, fully integrated oyster freezer and cannery. During the fall oyster-harvesting season, the plant will be placed in full operation. The Japanese plant was built under an agreement by which an oyster company located on the West Coast of the United States provided technical guidance in plant design and equipment as well as in the field of sanitation and quality control. This company also will distribute the oysters from the Hiroshima plant on a world-wide basis. Hiroshima was decided upon for the oyster plant because (1) the prefecture is the largest oyster-producing area in Japan, and thus was capable of supplying the very large requirements of the enterprise; (2) Hiroshima oysters are considered to be of especially fine quality; (3) the prefectural government was prepared to cooperate fully in the promulgation and enforcement of a shellfish sanitary code designed to comply with or exceed the most stringent requirements of any country in the world. Oyster supplies for the plant come from the extensive oyster culture areas of Hiroshima Bay, a triangular gulf in the western Inland Sea, with Kure, Hiroshima, and Miyajima as its points. Raft-culture only is employed, the oysters being grown on wires suspended from bamboo rafts so that the oysters never touch the sea bottom. This method keeps the oyster clean of mud, free from drills,	3, 2342 FAST FREEZING OF FROZEN FOODS WITH LIQUID NITROGEN Anonymous Industrial Refrigeration, pp. 26-27 (August 1960) Through the use of liquid nitrogen, foods can now be frozen in a matter of minutes. An automatic production unit recently was demonstrated at an industrial plant in Glendale, California, where the apparatus was engineered and manufactured. Utilizing liquid nitrogen as the freezing agent, the new device brings foods down from cooking temperatures (160° to 180°F.) to a completely frozen state (below 0°F.) in less than 5 minutes. Present methods of freezing normally would require a varying number of hours to complete the same cycle. Packages of cooked food, either open or sealed, are placed in wire baskets and then set into cascade-type conveyors that carry the food through a gentle shower of liquid nitrogen. The first exposure freezes the top layer of food and prevents any subsequent spillage or erratic action during the initial stages of the immersion. Moving from the shower area, the packages are immersed in a pool of liquid nitrogen at -320°F. As they pass from one end of the pool to the other, the packages are completely frozen. As they leave the unit the food packages are ready for storage or shipping to distributors. In just a matter of minutes the process has transformed the food from oven-hot to sub-zero freezer-cold. The immersion period in the liquid nitrogen and the overall speed of the process can be regulated according to the type, size, and density of the food, and to the exit temperature desired.
3, 231 FREEZING AND REFRIGERATION EQUIPMENT Anonymous Food Manufacture 35, 293-296, 312 (July 1960) Introduction. --Recent developments in the fields of accelerated freeze-drying, quick freezing, and refrigeration are described. Accelerated freeze drying. -- Commercial interest in the use of accelerated freeze-drying for the batch processing of foodstuffs has been quickened by an Irish sugar company's recent proposal to install an accelerated freeze-drying plant. Vacuum-dried foodstuffs have many commercial advantages, including extended shelf life at ordinary temperatures, ease and economy of transportation, and elimination of bulky storage equipment. It is claimed that the advantages are even more pronounced if moisture is removed from the solid-ice phase because shrinkage of the material is eliminated; impairment of taste, texture, or color does not occur; and reconstitution in most cases is almost instantaneous. One of the major technical problems in the design of suitable equipment for freeze-drying has been the transfer of sufficient heat to the food in order to produce the required rate of sublimation of the ice. A process developed by the Aberdeen Experimental Station of the Ministry of Agriculture, Fisheries, and Food has solved this problem. Heat is conducted directly to the top and bottom of the food via expanded metal heating plates. This method is satisfactory, although it does involve the processor in slightly higher costs than would be acceptable to firms working in a small-scale production. Another British firm is carrying out research to simplify the machinery, speed up drying and	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug (over) 3, 5 COD FROM NORWAY. II. KLIPFISH AND STOCKFISH Hammond, A. E. Food 28, No. 334, 356-358 (1959) (London) World Fisheries Abstracts 11, 7-8 (January-February 1960) Klipfish. --More than 90 percent of the fish exported from Norway is processed in one form or another. Of these products, klipfish, for which cod is chiefly used, is one of the most important. To produce klipfish, cod is first gutted and then cut upward along the spine in such a manner that the backbone can be removed and yet leave the skin along the back intact. The fish is then salted and stacked in layers and salt sprinkled liberally on each. After they have been left stacked in this way for a month, certain quantities are exported without further processing, Italy and Greece being the principal markets. For conversion into klipfish, salted cod is washed and then dried slowly at a specific temperature. The drying can be carried out naturally or artificially or by a combination of both. For natural drying, the fish are washed in the sea and then spread out on smooth flat rocks which, having become scorched by the sun or exposure to rain, must be avoided. The washing, the alternate spreading on the rocks, the collection and stacking, and the subsequent covering in the afternoon or evening are tasks generally carried out by women, large numbers of whom are employed at this work. This process is repeated every 2 days for 2 months, and for longer than that if unfavorable weather conditions prevent the fish from acquiring the right degree of dryness and the correct color. Artificially-dried salt cod is given the same preliminary salting process, but instead of being

processing times, and reduce drying costs. If the equipment is to be competitive on a large scale it must be part of a continuous processing system. In such a system, fragile materials probably would suffer damage due to movement under pressure.

Radiation heating.^{2,3} Owing to the high vacuum that is required for freeze-drying it is not practical to rely on a heat transfer by conduction or convection. The only alternatives are dielectric or radiant heating, but the heterogeneous nature of the foodstuffs give rise to certain problems if dielectric heating is used.

Infrared heating studies have shown that with suitable temperatures and tray materials satisfactory results can be obtained. It has been shown also that too high a temperature is not suitable owing to inconsistent drying and that the food responds best to the lowest possible temperature. Experiments have been carried out at a maximum drying temperature of 150°C. with promising results. This temperature can be obtained with electrically heated water.

Research is also being done to determine the extent to which ultralong wave radiation can assist the drying process. Another problem being investigated is the design of a suitable tray for the transportation of the foodstuffs. Initially an expanded metal or plastic tray about 1-inch deep will be employed. Infrared units have an advantage in that smaller cabinets are required for the same food load. They also eliminate damage due to pressure. The elimination of pressure plates from continuous processing systems will also reduce the amount of heat that is in direct contact with the food.

3.23 (Cross Reference: 1.81, 3.3341)

and in a continuously moving current of water; which is a combination of conditions that produces rapid growth. The growing areas have the same high standards as those where oysters are grown in the United States.

Hiroshima oysters are of the same species (*Ostrea gigas*) familiar for many years in the United States, and particularly on the Pacific Coast, under the name Pacific oysters. In the Hiroshima area, *Ostrea gigas* develops distinctive local characteristics that have been esteemed by the Japanese for centuries. This type of oyster is known to have been cultivated in the Hiroshima prefecture since the 15th century.

Oysters for the plant may come only from areas approved by the Hiroshima prefecture sanitary inspectors working under the most exacting specifications, with regular inspections and analytical harvests at stated intervals. Harvesting from a particular cultural area must be preceded by 30 days' advance notice to permit a final check and microscopic count procedure before the oysters are removed to advanced board harvesting vessels for transport to the packing plant. From the time they are removed from the water the oysters, although still in the shell, may be washed only with water that meets drinking-water standards.

The Hiroshima oyster plant is located on the city's Inland Sea front on dredged ground protected by a rock sea wall. The building is constructed entirely of reinforced concrete, aluminum, glass, and tile. Built in the form of a rectangle with the side toward the water open, each of the three sides is devoted to one of the three functional elements of the operation: oyster supply, freezing and cold storage, and canning.

The canned oysters will be of the traditional standard pack. The oysters will be fresh-opened and blanched according to the method that has become standard for oyster canning on the Pacific coast of the United States.

The plastic package of individually frozen oysters was market-tested in the United States before Coast of the United States.

The method was adopted by the Hiroshima enterprise. The American super-market selling price per package is expected to be in the neighborhood of 40 cents each.

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spread out on rocks, it is dried in kilns under controlled conditions of temperature and humidity. Salted and dried cod, or klipfish, is exported to South America, Brazil in particular, and also to Spain, Portugal and Cuba. Klipfish is packed in wooden cases, lightweight drums, and half-barrels, according to the requirements of the country to which it is exported.

Bags made of transparent cellulose film (Cellophane MSAT 300/30), while protecting their contents from moisture-vapor penetration, allow the fish to be seen and are said to have greatly reduced the costs of exporting this salted, air-dried codfish to Central and South America. The bags used are of satchel type, 6½ in. (17, 1 cm.) square with 1½ in. (3.8 cm.) gussets. Each bag holds 1 lb. (0.5 kg.) of fish.

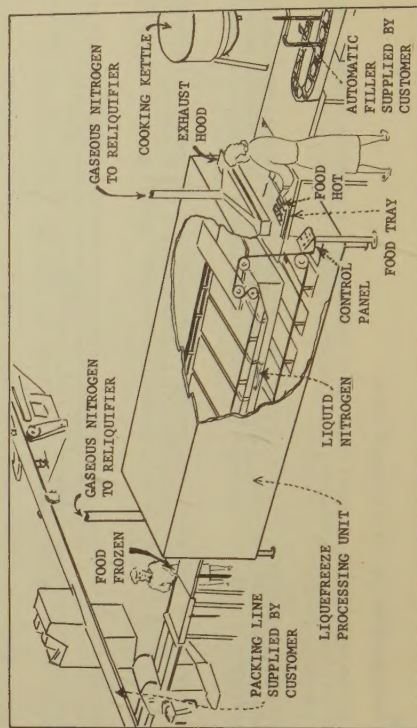
Stockfish. --The other method of preservation--by drying only--produces what is known as stockfish. Instead of being spread out on racks, these unsalted fish are suspended on wooden frames outdoors in such a manner that they are fully exposed to the drying effects of wind and sun. Although produced in certain other countries on a much smaller scale, stockfish, one of Norway's oldest exports (the Vikings used them for barter) is still regarded as an essentially Norwegian product.

Although stockfish contain, in concentrated form, virtually the same nutrients as fresh fish, the water content of these fish is only 12 to 15 percent, as compared with 80 percent in fresh fish. Indeed it takes 2½ lb. (2 kg.) of fresh fish to produce 1 lb. (0.45 kg.) of stockfish by the above method.

Because of its keeping qualities, stockfish is popular in tropical countries. Nigeria provides the most important market, and most other countries in West and Equatorial Africa import stockfish. Fairly large quantities are also sent to Italy. Stockfish are packed in bundles weighing 100 lb. (45 kg.) or sometimes in half-bundles, held by steel bands. The bundles are covered in bulk by hessian cloth.

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Measuring 16 feet by 8 feet by 8 feet, this automatic unit requires only 128 square feet of floor space. After being used for demonstration purposes, this unit will be installed in a plant belonging to a major food processor in the eastern United States.



3, 24 ODOR TRANSFERENCE FROM FISH TO BUTTER AND FRIED CHICKEN DURING FROZEN STORAGE Fiieger, Ernest A., and Novak, Arthur F. (Louisiana State University, Baton Rouge) Quick Frozen Foods 23, 94-96 (August 1960) Money is lost when fatty foods develop fishy odors during frozen storage. At times the customers of refrigerated warehouses allege that there has been a transmittal of fishy odors to odor-sensitive products even when no fisheries products have been stored with such commodities. To investigate this controversy, an experiment was designed in which deep fat-fried chicken and butter were packaged and frozen and then stored with and without fish. Samples were removed for flavor and odor evaluation at 6-month intervals during a period of 3 years. Transfer of fishy odors to fried chicken.--Fresh chickens were cut up, washed, dried, dipped in a mixture of flour, salt, and pepper, and fried in deep fat until done. The pieces of cooked chicken were placed in Mylar bags and heat sealed. Twelve packages of fried chicken were prepared and six were placed in each of two 50-pound lard cans. Two packages of frozen ocean perch were placed in one of the cans with the chicken and both cans were covered, sealed with tape, and refrigerated at 0°F. One package of chicken was removed from each can at the end of 7, 13, 18, 23, 30, and 35 months. The chicken from each package was examined for odor and flavor. In observing the odor, the judges were particularly on the alert for fishy or other off-odors. Flavor was observed both on the chicken when it was cold and after it had been heated. The conclusion reached after the 35-month storage test was that no fishy odor was transferred (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug	3, 320 STUDIES IN CANNING PROCESSES III. THE COOLING PHASE OF PROCESSES FOR PRODUCTS HEATING BY CONDUCTION Board, P. W.; Cowell, N. D.; and Hicks, E. W. (Commonwealth Scientific and Industrial Research Organization, Homebush, N.S.W., Australia) Food Research 25, 449-459 (July-August 1960) Introduction.--In canned foods, which heat by conduction, the cooling phase of the retort process makes a substantial contribution to the destruction of bacterial spores and to the lethality (F value) of the process. It is important, therefore, to evaluate the contribution of the cooling phase (F_c) as accurately as possible when evaluating the lethality of a process. Three methods for calculating F_c have been proposed. In the general method of process evaluation of Bigelow, Bohart, Richardson, and Ball (1920) and the variants of it, the calculations are based on experimentally determined temperature histories of test cans. In Ball's formula method and other methods based on it, a cooling curve of simple mathematical form was selected to represent extensive experimental data, and Ball's calculations were derived from this curve. Gillespy's method (1951) for evaluating the contribution of the cooling phase is based on the assumption that cooling in conduction-heating packs is purely by conduction. Under certain conditions, packs, which heat by conduction, may cool purely by conduction, but under other conditions there may be movement of the product in the can that results in faster cooling. The effect on F_c of the change from one cooling mechanism to the other may be large. Because Ball's method is based on a standard form of the cooling curve, which is substantially different from curves obtained experimentally, and because Gillespy's method depends on the product to cool purely by conduction, the authors decided to obtain further data to assess the agreement of the two mathematical methods with the general method of Bigelow et al. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd
3, 2495 DRIP FROM FROZEN WHALEMEAT AFFECTED BY FREEZING RATE AND AIR TEMPERATURE IN AIR DEFROSTING Tanaka, Kazuo and Tanaka, Takeo (Tokai Regional Fisheries Research Laboratory, Tokyo, Japan) Journal of the Tokyo University of Fisheries 43, 19-23 (March 1957) Frozen whalemeat is known to yield a large amount of drip on thawing. The amount depends largely on the freshness of the meat, but it also is affected by the rate at which the meat was frozen and by the temperature of the surrounding air during defrosting. The authors investigated the effects of these variables on the formation of drip in frozen whalemeat. Working from the viewpoint that drip is exuded from frozen whalemeat during thawing by the liberation of water from muscle protein that has been denatured during freezing and defrosting, the authors followed the change in drip value in relation to the adenosine triphosphate level and to the relation of protein nitrogen to total nitrogen in the drip. Experimental.--Blocks of lean meat from fin whales that had been caught in the Antarctic Ocean were cut into rectangular shapes about 12 cm. by 30 cm. by 39 cm. in size and roughly 15 kg. in weight, and frozen in still air at -18°C. for 24 hours or in a multiple freezer at -26°C. for 8 hours. Both prerigor and post-rigor samples were frozen. The samples frozen in still air were considered to be slow frozen and those frozen in the multiple freezer, to be quick frozen. The frozen samples were glazed, packed in cartons, and stored at -20°C. for about 3 months. Rectangular test pieces about 5 cm. by 10 cm. by 15 cm. in size and about 0.75 kg. in weight were cut from the frozen blocks and thawed in still air at +20°C. During thawing both the amount of drip and the pH of the drip were measured. With test pieces of the prerigor type, the adenosine (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug	4, 21 EPOXIDATION, PERACETIC ACID GROW TOGETHER Anonymous Chemical Week 87, 59-60 (July 2, 1960) A large chemical company recently offered six new commercial chemicals, all derivatives of its peracetic operations at Institute, West Virginia. Three of these compounds are epoxidized fats and oils, which points up how peracetic's welfare depends in part on growing markets for modified fatty products. The company's technical service supervisor for these products, points out that epoxy plasticizers find widest use in vinyl products. They give heat- and light-stability to vinyls used in sheeting film, extrusions, wire coatings, and auto fabrics. Epoxidized soybean oil had the largest share of the epoxidized fats and oils market or about 21 million pounds in 1959. This year modified soya production is expected to increase 12 percent, to 23.5 million pounds, and growing uses of vinyls will push demand for these plasticizers to near 35 million pounds by 1965. In 10 years the market is expected to demand about 44 million pounds per year. Some miscellaneous applications of epoxidized materials include use as an acid-accepting stabilizer in chlorinated solvents and as a plasticizer for rubber. Other developments now under study are applications as surface coatings and as a reactive diluent for standard epoxy resins of the epichlorohydrin-bisphenol A type. Of the three derivatives being offered for the epoxidized fats and oils market, two are epoxidized (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug

3. 2495 triphosphate level also was measured. Conclusions.--Upon examination of the data, which are presented in tabulated form (omitted), the authors concluded that to reduce drip value, the whalemeat of contractile type should be slow frozen; whereas noncontractile whalemeat should be quick frozen. The recommended temperature for defrosting whalemeat in still air is about +10°C.	4. 21 soybean oilstypes and one is an epoxy ester type. A fourth product, an epoxidized phthalate ester type will be offered later this summer.
3. 24 to the Mylar-packaged fried chicken that had been stored at 0°F. in the presence of commercially packaged fish. Transfer of fishy odors to butter.--Butter prepared for retail distribution by a Louisiana creamery, wrapped in regular butter-wrap paper and put up in 4-lb. prints--four to the carton, was obtained for this investigation. Graded by professional dairy personnel, the butter was assigned an initial score of 93 with a flavor rating of AA. Six pounds of butter were placed into each of two metal containers (50-lb. lard cans). Two packages of frozen raw fish were added to one of the cans containing the butter and then both cans were covered with lids, sealed with tape, and refrigerated at 0°F. One package of butter was removed from each can at 7, 13, 18, 23, 30, and 35 month intervals and examined for: (1) rating of butter (a) score and (b) flavor, including rancidity, both cold and after warming and (2) odor, fishy or off-odors. At the end of 7 months' storage the butter had absorbed a fishy odor. Overwrapping the cartons of butter with heat-sealed cellophane protected the quality of the butter stored in close proximity to commercially packaged fish.	3. 330 Experimental procedures.--Temperature measurements of steam and cooling water adjacent to the can and of the food in the can were made in a small laboratory retort and in two different retorts in commercial canneries with the aid of nichrome-constantan thermocouples. The test packs processed in the laboratory retort were baked beans, cream-style corn, tomato puree (9 percent soluble solids), and meat loaf in 401x411 cans; baked beans and tomato puree in 301x411 cans; and solid meat in 301x308 cans. These packs were used in 39 heat penetration experiments that covered different levels of retort temperature, can vacuum, retort pressure during cooling, delay between "steam off" and "water on," and the difference between the retort temperature and the center of the can temperature at "steam off." The test packs processed in the industrial retorts were vegetable soup in 301x411 and 301x211 cans, spaghetti bolognese in 301x411 cans, baked beans in 603x700 cans, and curried chicken in 401x211 cans. Findings.--The contribution of the cooling phase to the lethal value of a process (F_c) varied widely with the nature of the pack and the processing conditions. If a can was immersed in cooling water immediately as the steam was cut off, the value of F_c varied between an upper limit given by Gillespy's method of calculation and a lower limit that was ill-defined but fairly close to the value calculated by Ball's formula. In all but one of the experimental runs, Ball's method underestimated F_c, often by a factor that exceeded 2. Maintenance of an air pressure of 15 p.s.i.g. in the retort during cooling tended to increase F_c, particularly when the can vacuum was not high. Values of F_c close to the estimate given by Gillespy's method were often obtained with careful pressure cooling. Delay between cutting off steam and immersing the cans in cold water increased the lethal value of the process substantially. This was a major source of variation in F_c in industrial retorts. Conclusions.--The quality of some sensitive products may be improved by careful control of cooling conditions to ensure a high F_c value. This will correspond to a reduction in the length of the heating phase.

3. 3344	STUDIES ON TECHNICAL PROBLEMS IN THE PROCESSING OF CANNED CRAB (<u>PARALITHODES CAMTSCHATICA TILESUI</u>) Tanikawa, Eiichi (Faculty of Fisheries, Hokkaido University, Hakodate, Japan) Memoirs of the Faculty of Fisheries Hokkaido University <u>7</u> , Nos. 1 and 2, 95-155 (1959) In this paper, the author presents and discusses the technical problems that are encountered in canning king crab (<u>Paralithodes camtschaticus</u>). Part 1 describes the decomposition of raw king-crab meat on the basis of its histological characteristics. When the amount of volatile basic nitrogen in raw crab meat rises above 20 mg. percent, the meat becomes unfit for canning. In part 2, the author learned that the suitability of raw crab meat for canning depends upon the time and the temperature at which it has been stored. From these findings, he prepared a scale that indicates the maximum time that the raw meat can be held at various temperatures and still be suitable for canning. In practice, it also was necessary to know the limit of freshness of the cooked crab meat and the maximum time that the cooked meat can be stored before the limit is reached. Part 3 describes variations that occurred in the freshness of crab meat that had been cooked for 10 to 15 minutes at 60° to 65°C. or cooked for 15 minutes at 100°C. Here again the limit of the freshness of the cooked crab meat was determined from the view point of suitability for canning. From the results of this study, the author concluded as follows: When the freshness of the raw crab meat is below 10 mg. percent of volatile basic nitrogen, the limit of the freshness of the cooked meat should be 15 mg. percent. When the freshness of the raw meat is in the range of 10 to 20 mg. percent, the limit of the freshness of the cooked meat should be in the range of 10 to 13 mg. percent. When the freshness of the raw crab meat is above 20 mg. percent, even if the raw meat is cooked and processed (over)	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	ABSTRACTER: Martin Heerdt
3. 3343	CONTROL OF IRON SULFIDE DISCOLORATION IN CANNED SHRIMP (<u>XIPHOPENEUS</u> SP.) PART 1 Thompson, Mary H. and Waters, Melvin E. (U. S. Bureau of Commercial Fisheries, Pascagoula, Mississippi) Commercial Fisheries Review <u>22</u> , 1-7 (August 1960) For many years attempts have been made to utilize for canning purposes, certain species of shrimp, commonly known as seabob (<u>Xiphopeneus</u> sp.) only to find that regardless of the freshness of the shrimp at the time of canning, the canned product had an extremely short shelf life. These shrimp cause an iron sulfide discoloration or blackening of the exposed metal surfaces of the can, which gradually spreads over the entire surface and eventually causes the shrimp themselves to discolor. Commercial quantities of seabobs are found in the shallow waters of the Gulf of Mexico. These shrimp are small (70 to 80 count in the raw headless state) and are characterized by a very long up-turned rostrum and long antennae, with the two posterior walking legs elongated into antennae-like filaments. The supply of these shrimp far exceeds the demand for them. The average pH of well-iced seabobs is 7.5 when measured immediately after picking, whereas the average pH of well-iced shrimp of other Gulf commercial species at that time is 7.0. In other commercial species of shrimp a pH of the canned product exceeding 7.2 will allow iron sulfide discoloration. The difference in the normal pH of the two types of shrimp in the raw state, and the corresponding difference to be expected in the canned product, has led to experimentation in the lowering of the pH of the canned product in an effort to reduce the iron sulfide discoloration of the can and its contents. The present series of experiments were initiated to determine if pH was the primary factor (over)	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	ABSTRACTER: Kathryn L. Osterhaug
4. 11	FRACTIONATION OF FATS, OILS, AND WAXES ON THIN LAYERS OF SILICIC ACID Mangold, Helmut K. (University of Minnesota, The Hormel Institute, Austin) and Malins, Donald C. (U. S. Bureau of Commercial Fisheries, Seattle 2, Washington) Journal of the American Oil Chemists' Society <u>37</u> , 383-385 (August 1960) Introduction. --The technique of thin-layer, chromatography as described by Stahl (1956) has recently been used by the authors (1) for the fractionation of radioactive lipid derivatives into classes of compounds and (2) for the analysis of acetic fats that were obtained from various fish oils. The separation and identification of natural lipids by this technique is described here, and procedures are given for the separation of fats, oils, and waxes into their constituent lipid classes. Also described is the micro-scale resolution of unusual fatty acids that were present in total acid fractions. In addition, methods are outlined for separating unsaponifiable fractions obtained from natural lipid mixtures. Experimental. -- Natural products investigated in this study were as follows: jojoba oil (<u>Simmondsia chinensis</u>); castor oil (<u>Ricinus communis</u>); olive oil (<u>Olea europaea</u>); oticica oil (<u>Licania rigida</u>); lanolin (<u>Adeps lanae</u> U.S.P.); liver oils of soupfin shark (<u>Galeorhinus galeus</u>), basket shark (<u>Cetorhinus maximus</u>), and ratfish (<u>Hydrolagus collieri</u>); fur seal (<u>Callorhinus ursina</u> cynocephala) blubber oil. The procedures recommended by Stahl for the preparation of thin layers (250 to 275 μ) of silicic acid on glass plates (20x20 cm.), that is, "open columns" or "chromatoplates," were followed throughout this investigation. Thin layers of alumina were obtained similarly. Amounts of lipids between 5 and 500 γ were separated with mixtures of petroleum ether, diethyl ether, and acetic acid. Chromatograms were obtained by an ascending technique, that required 40 minutes at room temperature. Iodine vapors were used for locating unsaturated substances as brown spots on a yellow (over)	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	ABSTRACTER: Martin Heerdt
4. 29	INTERESTERIFICATION OF CUTTLE-FISH OIL AND SOYBEAN OIL Toyama, Yoshiyuki, Igarashi, Sadao; and Yamamoto, Tomoji Memoirs of the Faculty of Engineering, University of Nagoya <u>4</u> , 246-251 (November 1952) Cuttlefish oil and winterized oil prepared from it were subjected to interesterification for 24 hours by using a suspension of sodium methylate in xylene as catalyst in an amount of 0.6 percent sodium methylate, the reaction temperature being lowered stepwise from 25°C. to 7°C. Interestified oils were winterized at about 5°C., which produced oils in which the amounts of saturated acids in the mixed fatty acids were less than the amounts in the oils before the reaction by from 8.8 to 7.3 percent, but which still contained more than 8 percent of saturated acids. Since the amounts of tri-saturated glyceride formed by interesterification were found to be from 3.6 to 4.7 percent, some di-saturated glyceride as well as tri-saturated glyceride must have been removed by winterization after the reaction. The amount of tri-saturated glyceride formed by the interesterification of soybean oil with 0.7 percent of catalyst for 20 hours at 30° to 2°C. by stepwise lowering of the reaction temperature was found to be only 0.35 percent. On removal of tri-saturated glyceride together with some di-saturated glyceride by winterization of interesterified oil, a winterized oil was obtained having an iodine value of 137.7 and containing 8.5 percent of saturated acids in the mixed fatty acids. Comparing the oil obtained by winterization after the reaction with the oil as it was before the reaction, it was found that the iodine value and the amount of saturated acids are changed by only four units and 2.7 percent, respectively, by the winterization after the reaction. The oil obtained by winterization after the reaction was little superior to the oil before the reaction in its drying property. Thus, winterization even after the reaction is not notably effective for obtaining oils of higher unsaturation from oils that contain originally a relatively small amount of saturated acids. (over)	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	Authors' summary

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involved in the case of seabobs, and if so, what additives could be used to prevent such blackening. Because both citric acid and lemon juice concentrate have been suggested as additives to control this discoloration, it was decided to test their relative effectiveness in the first experiment of the series. The present series of tests were conducted at higher storage temperatures; however, further storage studies at normal temperatures are contemplated. A secondary aim was to suggest a possible time limit on the shelf life of such products. In the course of these experiments, a satisfactory method of processing these smaller shrimp was developed.

Summary. -- 1. A trial pack of shrimp (*Xiphopenus* sp.) was processed to determine the optimum level of lemon juice concentrate No. 309 or citric acid needed to prevent iron sulfide discoloration of the canned product.

2. Three large lots were processed (a) a control lot using no additives, (b) a lot containing 80 to 85 ml. of 1:40 lemon juice concentrate No. 309 in brine per can, and (c) a lot containing 80 to 85 ml. of a 0.65 percent citric acid in brine per can (0.52 g. of citric acid per can). These were stored at 47.5°C. (117.5°F.) for 90 days (360 simulated days). At the end of this period the cans were cut, the discoloration evaluated, and the pH of the contents measured. The following conclusions were obtained from these data:

When the pH was adjusted to a value below 6.6, only slight discoloration of the cans occurred after a storage of 360 simulated days. Fifty-one percent of the cans in the lot containing lemon juice were entirely free of blackening, whereas only 17 percent of the cans in the lot containing citric acid were free of discoloration. This disparity in percentage of cans free of discoloration would seem to indicate that some factor, in addition to acidification of the can contents, was active in reducing the iron sulfide discoloration.

In an evaluation of the pH of cans scoring 0, 0+, and 1, regardless of additive or score, no significant difference was found between the lemon-juice lot and the citric-acid lot, further indicating an additive effect obtained in using lemon juice. The only significant difference in pH values obtained was between the pH values of the cans graded 0, 0+, and 1 and those g-aded 3 (heavily discolored).

3. A third pack was processed to determine the optimum concentration of the ingredients. A concentration of 1:40 lemon juice concentrate No. 309 did not appreciably affect the taste of the shrimp.

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for canning without delay, good-quality canned crab is not obtainable. At this point, the author prepared a scale that shows the relationship between the storage temperature of the cooked crab meat and maximum storage time before canning.

In part 4, the author calculates the processing time for canned crab meat of varying degrees of freshness. He also diagrams relationships that are based on (1) storage temperature of the raw or cooked crab meat, (2) cooking methods, (3) freshness, and (4) the processing temperature and time for canned crab.

Part 5 describes problems concerned with canned crab prepared from crab meat that had been cooked for 10 to 15 minutes at 60° to 65°C. The autolytic action of enzymes was at a maximum in crab meat that had been cooked at 50°C., whereas the autolytic action of the enzymes was destroyed in crab meat that had been cooked at 90°C.

Part 6 describes the sour taste of a flat-sour-like spoilage of canned crab. The substances responsible for the sour taste were identified as volatile acids and formic acid in particular. The author learned that many kinds of volatile acids remain in the crab meat even after it has been cooked and that these volatile acids are transferred into the can with the crab meat.

4. 29

Conjugation of polyethylenic acids does not occur in the course of interesterification.

4. 11

background by the method of Mangold, Lamp, and Schlenk (1955). Both unsaturated and saturated lipids were evident under ultraviolet light, which had a maximum emission at 270 mμ, after spraying the chromatograms with a solution of 0.2 percent 2',7'-dichlorofluorescein in 95 percent ethanol.

Results. -- Adsorption chromatography on silicic acid can be used to fractionate lipids into classes of compounds. A slight degree of subfractionation within these classes can be observed in thin-layer chromatography. For example, triolein, trilinolein, and trilinolenin migrate at a slightly lower rate than do triglycerides of C-12 to C-18 saturated acids. Lanolin and soupfin shark-liver oil were resolved with the aid of a system that is based on 95 volumes of n-hexane and 5 volumes of diethyl ether. Mixtures of oleyl alcohol, cholesteryl palmitate, and squalene and of tristearin, vitamin-A palmitate, and squalene were chromatographed simultaneously with the natural mixtures.

Ratfish and basking shark-liver oils were fractionated with the aid of a system that is based on 90 volumes of petroleum ether (boiling point 30° to 60°C.), 10 volumes of diethyl ether, and 1 volume of acetic acid. Glycerol ethers, vitamin A, triglycerides, and glyceryl ether diesters were demonstrated in ratfish-liver oil. Glycerol ethers, vitamin A, triglycerides, a small amount of glyceryl ether diesters, and a substantial quantity of hydrocarbons were demonstrated in basking shark-liver oil. Unseparable fractions of fur seal blubber were separated by using a mixture of 70 volumes of petroleum ether, 30 volumes of diethyl ether, and 1 volume of acetic acid; and glyceryl ethers, cholesterol, vitamin A and hydrocarbons were identified by comparison with reference compounds.

Conclusions. -- Thin-layer chromatography permits rapid fractionation of small quantities of complex lipid mixtures ranging from hydrocarbons to phospholipids, according to classes. Closely related groups of compounds, such as triglycerides, glyceryl ether diesters, wax esters, and vitamin-A esters in fish oils, or triglycerides containing one, two, or three oxygenated fatty acids as in castor oil, can be separated within less than 1 hour.

POLAROGRAPHIC DETERMINATION OF METAL DRIERS
IN A NONAQUEOUS SOLUTION

Kuta, E. J. (University of California, Berkeley, California)
Analytical Chemistry 32, 1065-1068 (August 1960)

Introduction. --Metal driers find wide application as oil-oxidation catalysts in paints, fungicidal agents, lubricating greases, and waterproofing compounds. Copper, iron, and nickel driers, in addition to cobalt, manganese, lead, and zinc driers, can be determined directly by the polarographic procedure presented in this paper. In preliminary experiments, all of the metal driers that were studied, except iron octoate, at concentrations greater than 1.5 millimoles per liter, were completely soluble in a solution of benzene and methanol (1 to 1) in 0.3M sodium acetate.

Procedure. --Weigh 0.025 to 0.05 gram of metal drier sample into a 50-ml. ground glass-stoppered volumetric flask. Dissolve the sample in a solution of 0.3M sodium acetate in benzene-methanol (1 to 1) and dilute to 50 ml. Rinse and then fill the polarographic cell with this solution. Remove oxygen by deaeration with oxygen-free nitrogen for approximately 5 minutes. Add 1.5 ml. of mercury and continue deaeration for approximately 1 minute. Then divert the nitrogen stream, which is presaturated with solvent vapors from 1 to 1 by volume methanol-benzene mixture, to blanket the solution with an atmosphere of nitrogen. Record the polarogram between 0 and 2 volts versus mercury pool anode. Determine the height of the metal reduction wave, and make a blank correction for a solution of 0.3M sodium acetate under the same conditions. Calculate the concentration of the metal drier in the solution from the diffusion current by reference to calibration data obtained with a standard solution of the drier of known metal concentration, which has been treated by the above procedure.

Results. --The nonaqueous solutions of most of the metal driers showed well-defined polarograms in concentrations of up to 2 millimoles per liter of metal contents.

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Martin Heerdt

DIETARY MARINE FISH OILS AND CHOLESTEROL METABOLISM
2. THE EFFECT OF VITAMIN A AND LINGCOD LIVER OIL COMPONENTS
ON THE SERUM CHOLESTEROL LEVELS IN CHICKS

Wood, J. D. (Fisheries Research Board of Canada, Technological Station, Vancouver 8, British Columbia)
Canadian Journal of Biochemistry and Physiology 38, 879-887 (August 1960)

Introduction. --The effectiveness of various marine fish oils in preventing hypercholesterolemia in cholesterol-fed chicks was studied by Wood and Biely (1960), who found that lingcod liver oil and halibut-liver oil were very efficient hypocholesterolemic agents. Further work in this laboratory showed that the active factor in lingcod-liver oil was present in the unsaponifiable fraction of the oil. In contrast, De Groot and Reed (1959) found that cod-liver oil depressed the serum-cholesterol concentrations in rats but that the depressant factor was present in the fatty acid fraction. Liver oils from lingcod and halibut were most effective in preventing hypercholesterolemia in chicks as noted above. The possibility that vitamin A was the active factor in lingcod-liver oil therefore appeared to be worth investigating. Experiments were carried out in an attempt to identify the hypocholesterolemic factor in lingcod-liver oil unsaponifiable material and at the same time to study the influence of vitamin A on serum-cholesterol levels in cholesterol-fed chicks.

Experimental. --One-week-old white leghorn cockerels were used in the experiments. They were standardized by weight to eliminate any possibility of variation in serum-cholesterol levels due to differences in the size of the chicks. The basal diet employed in the experiments was the same as that used previously by Wood and Biely (1960). Cholesterol and the various dietary supplements were added. The birds were placed in groups of 16 and fed the appropriate diet and water ad libitum. After the required period of time, 0.5 ml. of blood was collected from the wing of each chick, the blood from four birds was pooled, and the serum was collected in the normal manner. The free and total

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ABSTRACTER: Martin Heerdt

USE OF FISH OIL FRACTIONS IN REDUCING ELEVATED
BLOOD-CHOLESTEROL LEVELS

Anonymous
Fishing Gazette 77, 26-27 (August 1960)

The residual oils found in fish meals traditionally have been valued only as a source of energy. Recent research findings on the efficacy of fish oils in reducing elevated blood-cholesterol levels have inspired a basic reconsideration of the possible contributions of these residual oils to the overall nutritive value of the formulated animal feed.

Many recent reports have indicated possible beneficial physiological effects attendant upon reduction of elevated blood cholesterol by adjustment of the dietary fat intake. The key point of the Linoleic acid has received the most attention in this regard. The effective principle in linoleic acid appears to be related to its two points of unsaturation.

Current reports indicate that the efficiency of a fatty acid in reducing blood-cholesterol levels is a direct function of its degree of unsaturation and not a measure of its essential fatty-acid activity.

Fish oils are rich in extremely unsaturated fatty acids and, therefore, were investigated for their cholesterol depressant effect. Research studies indicate that both fish oils and individual fish-oil fatty acids are considerably more effective in reducing blood cholesterol than is linoleic acid.

The research also demonstrated conclusively that there is some form of direct relationship between the degree of unsaturation and the degree of cholesterol reduction.

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ABSTRACTER: Kathryn L. Osterhaug

DIETARY FATS AND THE DIABETIC PATIENT

Kinsell, Laurance W.; Walker, Geoffrey; Michaels, George D.; and Olson, Florence E.
New England Journal of Medicine 261, 431-434 (August 27, 1959)

Vascular disease represents the foremost long-term problem in the diabetic patient. It has been abundantly demonstrated that diabetes predisposes to earlier onset and more rapid progression of atherosclerosis as compared to the clinical pattern of the disease in the nondiabetic portion of the population. The reasons for this remain to be precisely defined. In addition to atherosclerosis, the diabetic person is subject to a form of vascular disease involving the eyes and kidneys that to all intents and purposes is not found in any other disease.

The question arises whether these diseases are related to qualitative or quantitative abnormalities of the diet and, if so, whether any specific dietary modification will result in prevention of such abnormalities or improvement in existing disease. This paper suggests an approach to the problem.

Summary and conclusions. --A dietary approach to the problem of vascular disease in the diabetic patient is outlined. This approach is based on the well-documented observations that diets containing relatively large amounts of polyunsaturated fat, modest amounts of carbohydrate, adequate amounts of protein, and limited amounts of saturated fat are associated with normal levels of blood lipids. It is hoped that the maintenance of such blood lipid levels will have value both prophylactically and therapeutically regarding atherosclerosis and diabetic retinopathy-nephropathy. Some observations of the last several years support such a concept, but much additional time and work will be required to document this statement adequately.

Recent observations indicate that substitution of polyunsaturated fat for saturated-monounsaturated fat is also associated with better diabetic management in terms of blood sugar levels.

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Reprinted in part

POLAROGRAPHIC ASSAY OF METAL DRIERS

VITAMIN A VS. SERUM CHOLESTEROL

BLOOD-CHOLESTEROL REDUCTION

POLYUNSATURATED FAT IN DIABETES

4. 80

cholesterol contents of the samples were determined by the method of Sperry and Webb (1950).

Preparation of lingcod-liver oil unsaponifiable material. --One pound of lingcod-liver oil was mixed thoroughly with 4 liters of ethanol and 300 ml. of a potassium hydroxide in water solution, 3 to 2 by weight-to-volume. The mixture was boiled gently under reflux for 30 minutes and then distilled until 2 liters ethanol had been removed. The remaining solution, after dilution with 5 liters water, was extracted several times with ethyl ether to obtain the unsaponifiable material.

Preparation of lingcod-liver oil fatty acids. --The saponification mixture, after removal of the unsaponifiable material, was acidified with hydrochloric acid and extracted several times with ethyl ether.

Fractionation of lingcod-liver oil unsaponifiable material. --Fractionation was based on the method of Swain (1948) and was carried out by using a 75-mm. diameter column containing 900 g. of aluminum oxide (Woelm, basic, active grade 1) equilibrated with 5 percent water. A slurry of the adsorbent in petroleum ether (boiling point 65° to 110°C.) was poured into the column, which was fitted at the bottom with a perforated, fritted glass disk plus a thin layer of glass wool. The unsaponifiable material dissolved in petroleum ether to give a final concentration of 2 percent was applied to the column. This was followed by more petroleum ether, benzene, methylene chloride, and methanol in that order. The effluent was collected in fractions.

Results. --Lingcod-liver oil unsaponifiable material was separated into three main fractions on an aluminum oxide column. Major components of the three fractions were vitamin A, cholesterol, and glyceryl ethers, respectively. The fraction that contained vitamin A prevented the hypercholesterolemia in chicks. Crystalline vitamin-A acetate produced a similar effect when it was added as a dietary supplement. The authors concluded that vitamin A was probably the hypocholesterolemic agent in lingcod-liver oil, although other compounds in the oil may also exert some influence on the control of serum-cholesterol concentrations in chicks.

4. 83

Interfering substances in estimation of iron in menhaden oil. --In attempting to apply the polarographic procedure to the detection of the metal content in fats and oils, the concentration of sodium acetate was decreased from 0.3 to 0.1M to increase the solubility of the oils in the solvent. On this basis 2.5 percent by weight-to-volume could be dissolved. Polarograms of lard, soybean oil, and menhaden oil with 48 p.p.m. of iron in the form of iron octoate in the oil, gave reduction waves at half-wave potentials of -1.06 and -1.60 volts. While the reduction wave at -1.06 volts was due to the peroxidic material, the latter was associated with the added iron and possibly with the free fatty acids. The menhaden oil used in this experiment contained 2.2 percent free fatty acid calculated as oleic acid.

To eliminate the interference of the free fatty acids, which are known to give a reduction wave in this region, the experiment was repeated, except that the menhaden oil was allowed to build up a peroxidic value of 10 with 6, 12, 25, and 48 p.p.m. of iron. The result was a series of polarograms with reduction waves at a half-wave potential of -1.73 volts. Determination of the iron content of the oil then became difficult as the reduction wave shifted toward the solvent decomposition potential.

An attempt was made to remove the peroxidic material to enable a more precise analysis of the reduction wave of iron. Polarograms of this menhaden oil showed reduction waves at half-wave potentials of -1.16 volts and a slight reduction wave at -1.48 volts which merged into the solvent decomposition potential at the highest concentration of 48 p.p.m. of iron. Thus catalytic decomposition of the peroxidic materials caused a decrease in the useful range of the polarograms. The iron content in menhaden or possibly other oils (free from fatty acids) could be estimated, if the peroxidic content and decomposition products from the peroxidic material were reduced to a minimum.

4. 91

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Fish oils are outstanding in the large proportion of highly unsaturated fatty acids they contain. About half of the 70 to 80 percent of the unsaturated fatty acids of fish oils contain 3, 4, 5, or 6 double bonds, whereas corn oil contains fatty acids with only 1 or 2 double bonds. Usually, 29 percent or more of the total fatty acids of a fish oil have 5 or 6 double bonds.

In summary, the following characteristics of fish-oil fatty acids appear to justify their use, and the use of fishery products in general, in clinical research on the treatment of persons suffering from the effects of elevated blood-cholesterol:

1. They show greater effectiveness in reducing blood-cholesterol levels than agents or oils now in use.
2. They are immediately effective in contrast with the delayed effectiveness of other products now in use.
3. Encapsulated concentrates of highly unsaturated fatty-acid fractions form a much more palatable method of treatment at minimal additional caloric intake and with lessened danger of further strain upon the fatty-acid metabolic system.
4. When prepared under properly controlled processing conditions, problems of possible toxicities appear to be of a negligible order.

4, 91	SATURATION OF DIETARY FATS AND LIVER AND SERUM LIPIDS	Anonymous Nutrition Review 18, 244-246 (August 1960)	Introduction. --Diets that contain large amounts of unsaturated fatty acids promote the reduction of serum cholesterol levels (Kinsell et al., J. Clin. Nutrition 1, 224 [1953]). This action may be the result of essential fatty acids that facilitate the transport or catabolism of cholesterol and prevent its deposition in arterial walls.	6, 195	PLASMA AMINO ACIDS AND DIETARY PROTEIN	Anonymous Nutrition Reviews 18, 252-254 (August 1960)	The nutritive value of a dietary protein depends upon how closely the relative quantities of its amino acids that reach the tissues of a subject correspond with the relative quantities of amino acids that are required by the tissues. A nutritionally perfect protein would (1) be completely digestible, (2) have a ratio of dispensable to indispensable amino acids identical with that required by the subject (a ratio as yet undetermined), and (3) have a pattern of indispensable amino acids that coincided with the pattern of amino acids required by the subject. The extent to which the pattern of indispensable amino acids in a protein deviates from a standard that approaches the ideal gives a fairly good estimate of the nutritive value of that protein. This is the basis for the chemical-score method of estimating protein quality as devised by Block and Mitchell (Nutrition Abstracts and Reviews 16, 249 [1946]), who used the amino acid pattern of the proteins of whole egg as a reference standard.
	Okay et al. (Metabolism 8, 241 [1959]), studied the effect of unsaturation of dietary fats on liver and serum lipids to determine the extent to which the fatty acids of liver cholesterol esters were altered by feeding various fats. In this study, each of 13 rats were used as supplements at a 10-percent level to an adequate fat-free basal diet. Each of the supplemented diets was fed to a group of 10 male and 10 female rats, whereas a second group of 20 rats received the same diets supplemented with 1 percent of cholesterol. The feeding began at weaning and continued for 7 weeks. Tissue samples were extracted to determine total lipids and cholesterol, and cholesterol esters were isolated on silicic acid columns. After saponification and extraction of cholesterol, the fatty acids were acidified and extracted. Spectrophotometric analysis was used to determine the percentages of polyunsaturated fatty acids. As a further check, silicic acid-paper chromatography was used to provide information about the monoenoic acid content.		Okay et al. found no apparent relationship between diet content of unsaturated fatty acids and the (over)		Two recent attempts to design amino acid patterns that would serve specifically as reference standards for human nutrition studies are (Protein Requirements, Food and Agriculture Organization Nutritional Studies No. 16, (1957) and Evaluation of Protein Nutrition, National Academy of Sciences-National Research Council Publication No. 711 (1959).	Among the experimental methods that have been used to estimate the nutritive value of a protein (Nutrition Reviews 10, 33 [1952]) are the nitrogen balance-technique for the classical determination of biological value or net protein utilization (Mitchell, J. Biol. Chem. 58, 873, 905 [1923]), the rat growth assay for the determination of protein efficiency ratio (Osborne and Mendel, Ibid. 32, 369 [1917]), and carcass protein or moisture analyses (Miller and Bender, Brit. J. Nutrition 9, 362 [1955]).	
6, 195	EVALUATION OF PROTEIN IN FOODS VI. FURTHER FACTORS INFLUENCING THE PROTEIN EFFICIENCY RATIO OF FOODS	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	Middleton, E. J.; Morrison, A. B.; and Campbell, J. A. (Food and Drug Laboratories, Department of National Health and Welfare, Ottawa, Canada) Canadian Journal of Biochemistry and Physiology 38, 865-869 (August 1960)	6, 195	AMINO ACID IMBALANCE, II.	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	Introduction. --This is the second in a new series of papers on amino acid balance and imbalance (Harper, J. Nutrition 68, 405 [1959]; Nutrition Reviews 18, 113 [1960]). Harper regards amino imbalance as any change in the proportions of amino acids in the diet that results in an adverse effect, which can be prevented by supplementing the diet with a relatively small amount of the most limiting amino acid or acids (Harper, Ann. N. Y. Acad. Sci. 69, 1025 [1958]; Nutrition Reviews 14, 225 [1956] Ibid. 17, 122, 282 [1959]).
	Experimental. --In previous reports from this laboratory, Chapman, Castillo, and Campbell (1959) and Morrison and Campbell (1959) showed that protein efficiency ratio values are influenced (1) by the strain and sex of the rats used, (2) by the age of the rats at the beginning of the experiments, (3) by the length of the experimental period, and (4) by the level of dietary protein. These workers concluded that these factors must be standardized if comparable results are to be obtained in different laboratories. In the present studies, protein efficiency ratio values that are found with diets containing 15 percent protein and 20 percent fat, the levels in the average diet, were compared with those obtained by using the procedure of Chapman et al. (1959), in which the diets contained 10 percent protein and 10 percent fat. The effects of the type of dietary carbohydrate source, and the presence of an antibiotic in the diet, were also briefly investigated.		Experimental. --In the initial experiments, the rate of weight gain of weanling rats fed for 2 weeks on diets that contained different levels (from 10 to 88 percent) of wheat gluten without supplements of lysine, increased stepwise with each increase in the dietary level of wheat gluten up to 70 percent. From 70 to 88 percent, there was no growth but neither was there a depression of the rate of growth. The rate of gain of rats fed different levels (from 10 to 60 percent) of wheat gluten, supplemented in each case with 1 percent lysine, was maximum when the diet contained 30 percent wheat gluten.		These studies suggested that the levels of lysine needed to support maximum growth increased as the level of wheat gluten was raised. Therefore, diets containing 30, 47, 53, and 60 percent wheat gluten (0.5, 0.8, 0.9, and 1.0 percent, respectively, were selected; and the effects of supplementing each of these three levels of lysine were determined. For maximum weight gain the lysine requirement had to be increased from 0.8 to 0.9 percent on the 30 percent wheat gluten diet to about 1.2 percent on the 60 percent wheat gluten diet.	The preceding experiment was repeated using diets made isocaloric by the addition of corn oil (over)	
6, 195	DIETARY FATS AND SERUM LIPIDS	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	ABSTRACTER: Martin Heerd	6, 195	AMINO ACID IMBALANCE	COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	Reprinted in part
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percent corn oil. Proteins fed in this experiment were casein and a mixture of plant proteins, which consisted of wholewheat flour 75 percent, wheat gluten 20 percent, and toasted soybean protein 5 percent. The basal protein-free diet used was that of Chapman et al. (1959). To obtain the desired dietary levels, protein and fat were added to the basal protein-free diet at the expense of cornstarch. The baseline group of rats was sacrificed by ether anesthesia, exsanguinated, and eviscerated. Carcasses were frozen, ground in the frozen state, and analyzed for nitrogen, moisture, and total lipid. In addition, the livers were analyzed for total lipid. Nitrogen was determined by the micro-Kjeldahl procedure, total lipid by the method of Folch et al. (1957), and moisture by drying an aliquot of each sample at 115°C. for 24 hours. At the end of the experiment (28 days), the remaining animals were killed and treated in the same manner.

In the second experiment, two groups of eight rats of the Food and Drug strain received the protein-free diet of Chapman et al. (1959), supplemented with 10 percent casein protein and with either sucrose or cornstarch as the dietary carbohydrate. Two other groups received similar diets that contained 100 P.P.M. of chlorotetracycline.

Results. --With a diet that contained 10 percent protein and 10 percent fat the protein efficiency ratio for casein was slightly greater than with a diet that contained 15 percent protein and 20 percent fat, which approximates the levels found in the average Canadian diet. The value for plant protein was similar under both conditions. Efficiency of carcass protein synthesis was much greater in animals fed casein than in those fed plant protein. With both sources of protein, the efficiency of carcass protein synthesis was similar regardless of whether the diets contained 10 percent protein and 10 percent fat or 15 percent protein and 20 percent fat. The source of the dietary carbohydrate and the addition of chlorotetracycline to the diet did not affect the protein efficiency ratio of casein. The authors concluded that protein efficiency ratio determinations carried out on a 10-percent protein diet furnished a valid estimate of the nutritive value of protein and had several practical advantages.

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amount of weight gained; however, the diets did not contain enough fat to induce fatty livers. The objective of Okey et al. was to measure the result of alteration in the composition of dietary fat on the retention of food cholesterol. One trend observed in the young males was that liver cholesterol values decreased as iodine numbers decreased, but that serum cholesterol levels remained relatively constant. This same finding was reported by Best, Lucas, Patterson, and Ridout (Canad. J. Biochem. Physiol., 36, 613 [1958]), although their experiments were not strictly comparable.

As the mean, chain length of dietary fatty acids increased, the liver lipids and cholesterol levels tended to increase. The cholesterol liver storage observed in rats fed hardened cottonseed oil suggested that long-chain saturated fatty acids may have been influential. Cholesterol-fed females fed safflower-seed oil, cottonseed oil, olive oil, lard, shortening, and coconut oil had high levels of serum cholesterol. The males fed cholesterol had a lower level of circulating cholesterol and higher liver lipids than the females, with the exception that liver cholesterol was higher in the females when the rats were fed menhaden, safflower, corn, and olive oil.

Circulating cholesterol is utilized in intermediary metabolism and restored from the liver reservoir. The rat appears to be unharmed while efficiently storing large quantities of cholesterol in the liver. If this storage is pathological, then the data on growth, liver cholesterol, and serum cholesterol do not suggest that essential dietary fatty acids or linoleate are able to control the accumulation.

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with the diet that contained 60 percent of wheat gluten. The weight gain of rats fed diets containing a particular level of lysine fell off as the dietary level of protein was increased. However, the amount of lysine required to support maximal growth with the lower levels of wheat gluten was somewhat higher than observed in the preceding experiment. This indicated that the effect of wheat gluten level on lysine requirement observed previously was partly a result of the higher calorie content of diets containing high levels of wheat gluten and only partly a result of the increase in the dietary level of protein.

Findings. --The results of the last series of experiments, in which diets containing a mixture of 30 percent wheat gluten and 30 percent zein were supplemented with graded levels of L-lysine monohydrochloride (0.5 and 0.8 percent), confirm the similarity between the effect of higher levels of protein and the effect of amino acid imbalance on the lysine requirement. Replacing 30 percent of the dextrin in the control diet with zein resulted in a significant lowering of weight gain. Additional lysine (0.3 percent) was needed to return gain to control values. Calculations made by the authors showed that as the wheat gluten content of the diet was increased from 30 to 53 percent, the lysine requirement for maximum gain increased from 1.0 to about 1.2 percent of the diet, or from 1.4 to 1.6 g. of lysine for the whole 2 weeks for rats consuming isocaloric diets containing about 12.5 percent of fat.

Conclusions. --Wheat gluten, the authors conclude, is so severely unbalanced owing to its very low lysine level that the lysine it contains is not completely utilized. Maximum growth cannot be obtained by increasing the level of wheat gluten to provide 0.9 percent lysine in the diet. However, if the lysine level is increased sufficiently to exceed the requirement slightly, either by increasing the level of protein (80 percent wheat gluten) or by supplementing with ly^2 (to 1.2 percent), a considerable excess of amino acids in the diet can be tolerated.

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An investigation by Longenecker and House on the relationship between plasma amino acid concentrations and the composition of the ingested protein (Arch. Biochem. Biophys., 84, 46 [1959]) should elicit much interest. The basic assumptions underlying the investigation are that the amino acid composition of the blood plasma of animals fed a single, test meal should depend not only upon the amino acid composition of the dietary protein but also upon the rate and extent to which it is digested and upon the rate and extent to which the various amino acids are metabolized by the body. Their method was developed from experiments that were performed on adult mongrel dogs, which weighed about 10 kg.

The concentrations of the essential amino acids in the plasma of each dog at each hourly interval were tabulated, but no consistent relationship between the amino acid composition of the protein ingested and that of the blood plasma was evident. In an effort to bring some order out of what appeared to be chaos, the authors calculated what they called plasma amino acid ratios. This was done by averaging the five, hourly plasma values for each amino acid and then subtracting the corresponding fasting value to obtain a measure of the change in the plasma concentration of each amino acid after the ingestion of the test meal. Each of the values so obtained was divided by the corresponding value for the requirement of the dog, and this multiplied by 100 was taken as the plasma amino ratio for that amino acid. The values obtained for different amino acids in these experiments ranged from -65 to 58.

The sequences obtained for the more limiting amino acids of gelatin and wheat gluten corresponded fairly well with the sequences calculated by the chemical-score method. The sequences for the less limiting amino acids of gelatin and wheat gluten and for casein did not show such close correspondence.

6. 54 NUTRITIONAL VALUE OF FISH FLOUR SUPPLEMENTS Metta, V. Chalam Journal of the American Dietetic Association 37, 234-240 (September 1960) A process for making an odorless, stable fish flour of high biologic quality recently was reported. In this process the fish are desiccated, defatted, and deodorized by azeotropic solvent extraction. Sure (1957) found that a small amount of the defatted fish flour, when added to milled flour, corn meal, and rice and fed to rats resulted in large body gains and increased protein efficiency as compared to a diet composed of dried nonfat milk, dried buttermilk, defatted soybean flour, brewer's yeast, cultured food yeasts, and peanut flour. Because Sure fed his animals ad libitum and the fish flour-supplemented groups always ate appreciably more than the controls, his data on improved growth and better protein-efficiency ratios caused by supplementation with fish flour may represent exaggerated values. The purpose of the investigation reported here was to report on (a) the biologic value of the protein of fish flour, (b) the effect on growth and protein efficiency of adding 1 to 3 percent fish flour to East Indian diets, and (c) the consumer acceptance of the fish flour. Biologic value of fish flour.--The protein value of the fish flour was measured by a growth test and a nitrogen-balance test. The results were compared with data obtained by the use of whole egg protein. Rats were used in both of the experiments. Proximate analysis of the fish flour showed 83.1 percent protein, 13.2 percent ash, 0.4 percent ether extract, 3.7 percent moisture, and 4.14 calories gross energy per gram. Two balanced diets were used for comparative tests. In one, whole egg powder was used as the (over) COMMERCIAL FISHERIES ABSTRACTS VOL XIII, NO. 12, PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug	7. 65 AN EVALUATION OF FACTORS AFFECTING THE SURVIVAL OF ESCHERICHIA COLI IN SEA WATER I. EXPERIMENTAL PROCEDURES Carlucci, A. F. and Pramer, David (Department of Agricultural Microbiology, Rutgers University, New Brunswick, New Jersey) Applied Microbiology 8, 243-247 (July 1960) Experimental procedures.--Selective media for the isolation and enumeration of coliform bacteria are available commercially. Of these, EMB agar and Tergitol 7 agar favor growth of <i>E. coli</i> and facilitate its identification. <i>Escherichia coli</i> developed best on Tergitol 7 agar, producing a yellow colony surrounded by a yellow halo. The addition of 40 p.p.m. bacteria-free triphenyltetrazolium chloride to the agar facilitated the identification of <i>E. coli</i> without influencing its growth. Sampling.--Water samples were obtained from two different sites in order to obtain both bay water and sea water. Samples collected over a period of 2 years were found to have a relatively constant pH value (7.8 to 8.0) but to have a salt content that varied from 2.7 to 3.2 percent. Lower salinity values were found when samples were collected after heavy rainfall. In general, bacteria that develop in sea-water nutrient agar were present in higher numbers than organisms that develop on agar prepared with distilled water. The total numbers of bacteria in sea water never exceeded 10,000 per ml. and averaged approximately 1,000 per ml. Cells of <i>A. aerogenes</i> were detected in every sample taken and averaged about 100 per ml. <i>Escherichia coli</i> was present in only one-half of the samples and the counts averaged about 50 per ml. When washed cells of <i>E. coli</i> were added to sea water and counts made daily, the survival curves obtained showed a lag phase of approximately 24 hours, a period of linear decline or logarithmic death lasting 48 to 72 hours, and a final equilibrium phase in which the curve became asymptotic. In (over) COMMERCIAL FISHERIES ABSTRACTS VOL XIII, NO. 12, PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug
7. 53 RAPID METHOD FOR MOISTURE AND FAT DETERMINATION IN BIOLOGICAL MATERIALS Wistreich, Hugo E.; Thompson, John E.; and Karmas, Endel (Reliable Packing Co., Research Laboratory, Chicago 9, Illinois) Analytical Chemistry 32, 1054 (July 1960) Introduction.--This paper describes a method for the simultaneous extraction of moisture and fat from biological materials. The apparatus consists of a reflux condenser, a Bidwell-Sterling-type receiver arm, and a specially designed flask. The flask has a volume of 780 ml. and is divided into two compartments by a curved complete separation so that the solvent will travel from one compartment into the other only by overflowing. Compartment A is directly under the mouth of the flask and is approximately one-fourth the size of compartment B. Procedure.--Three hundred milliliters of toluene, tetrachloroethylene, or any other azeotrope-forming fat solvent, immiscible with water, are added to the flask. The solvent level in compartment B must be at least 2 centimeters below the level in compartment A. Approximately 10 grams of the material to be analyzed are placed in a tared 9-centimeter Soxhlet extraction thimble. The thimble is plugged with a tared glass wool plug, is lowered into compartment A of the flask, and the apparatus is assembled. The flask is heated with a hot plate or a heating mantle, and distillation is continued for 2 hours from the time it begins. The solvent and water azeotrope separates in the condenser, water collects in the receiver, and the solvent returns to the flask. All of the returning solvent falls into compartment A and then overflows into compartment B. As the solvent evaporates at an equal rate from both compartments, five times as much solvent returns to compartment A as evaporates from it. This flow of solvent carries the fat extracted from the sample into compartment B. After distillation has (over) COMMERCIAL FISHERIES ABSTRACTS VOL XIII, NO. 12, PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd	8. 0 SEASONAL VARIATIONS OF PHYSICAL CHARACTERISTICS AND CHEMICAL COMPOSITION OF FISH FROM MIDDLE ATLANTIC STATES Wangler, John G. (U. S. Bureau of Commercial Fisheries, College Park, Maryland) Commercial Fisheries Review 22, 17-20 (July 1960) Introduction.--An investigation to determine the physical characteristics and chemical composition of various species of fish obtained from the waters of the Middle Atlantic States is being made by the staff of the U. S. Bureau of Commercial Fisheries Technological Laboratory, College Park, Maryland. Such information is of value to fish processors, nutritionists, and members of the medical profession. The chemical composition of the nonedible portion of fish is of value in the pet-food and other animal-feed industries. Variations in physical characteristics and chemical compositions are considered important, since it has been generally realized for some time that these factors differ considerably, not only from species to species but often to an even greater extent from one fish to another of the same species. These variations--according to Atwater (1892), Tressler and Lemon (1951), and Slausby (1954)--may be related to the season of the year when the fish are caught, the geographical area in which the fish are located, the age of the fish, or other factors that have not been identified. For composition data to be of real value, then, it is necessary to determine the extent of differences that may exist. In this report information is presented on the seasonal variations in the physical measurements and the chemical composition of four species of commercially important fish of the Middle Atlantic States. Procedure.--Sea bass (<i>Centropomus striatus</i>), flounder or blackback (<i>Pseudopleuronectes americanus</i>), fluke (<i>Paralichthys dentatus</i>), and scup or porgy (<i>Stenotomus chrysops</i>) were obtained in (over) COMMERCIAL FISHERIES ABSTRACTS VOL XIII, NO. 12, PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd

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continued for 2 hours or after no more water is visible in the condensate, heating is discontinued and the apparatus is allowed to cool.

The apparatus is disconnected, and the thimble is removed, allowed to drain, and placed for 1 hour in an air oven to allow for evaporation of residual solvent. After solvent evaporation is complete, the dried thimble is weighed; and the weight of the residue is determined. The water receiver is set aside. At the end of 1 hour the volume of water in the receiver is read and tabulated. Water droplets that adhere to the walls of the receiver may be set free by rinsing with a surface active agent which contains some solvent. Fat may be determined by evaporation of the solvent after the extract has been transferred quantitatively into a dry evaporator flask or as it is more frequently done, by difference.

Results and discussion.--The results of analyses of some meat products are tabulated for comparison below. The amount of moisture obtained by the new method was slightly greater than that obtained by drying in an oven at 110°C., probably because case-hardening does not occur with the new method. The data were obtained in 3 hours instead of the usual 24 hours.

Individual values obtained in an analysis of meat products

	Moisture by new method		Moisture by air oven		Fat by Soxhlet extraction	
	Percent	Percent	Percent	Percent	Percent	Percent
Bacon	22.4	22.8	66.9	66.4		
Pork skin	56.0	52.0	10.8	9.0		
Pork muscle	73.5	73.2	5.9	6.1		
Ground meat	53.5	52.5	31.6	31.9		
Sausage	51.0	51.2	27.5	27.2		

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source of protein, and in the other, fish flour supplied the protein. Each diet contained 10 percent protein by analysis.

In the growth test, 10 growing male rats (five on each diet) were housed individually and pair-fed equal amounts of the test diets for 21 days. During this period, the amount of food offered gradually was increased. At the end of the 21-day-period the rats were sacrificed and the body weights, minus intestinal contents, were recorded.

The results of this experiment show that the growth-promoting value of the fish flour protein was 91 percent of that of the whole egg protein, and that the protein efficiency ratio, 3.236, was 90 percent of that of the whole egg protein.

A nitrogen-balance test was undertaken because nitrogen retention is considered to be a more accurate measure of protein function than is growth. The same two diets were used in this test as were used in the growth test.

Ten growing male rats were pair-fed these diets for 14 days. During the final 7 days individual excreta was collected. Samples of the test diets and of the excreta were analyzed for total nitrogen by the Kjeldahl-Wilfirth-Gunning method and the biological values of the fish and egg proteins computed. Results of the test demonstrate a high nutritive value for the fish flour protein. The biologic value of 88 percent is superior to meat, which is 78 percent, and is comparable to the biologic value of 89 percent for milk.

Protein supplementing value of fish flour.--The effect on growing rats of supplementing East Indian-type diets with small quantities of fish flour was studied by the Mitchell method of equal food intake. The test diets were representative of the diets used by the lower-middle and lower-income groups in India. In spite of a possible deficiency of vitamins and minerals in the poor Indian diets, the test diets were balanced for these nutrients because the main purpose of the study was to measure the protein-supplementing effect of fish flour on growth.

The protein efficiency ratios of most of the cereal diets were also improved significantly following 3 percent fish-flour supplementation, indicating a better amino acid mixture in the supplemented diets.

Consumer acceptance test.--A consumer panel of 26 Indian students was not able to detect the addition of 3 percent fish flour to Indian diets.

8. 0 (Cross Reference: 1. 0116)

the fresh state from both spring and summer catches at New Jersey coastal ports and the New York City, Fulton Fish Market. Data were obtained on the size of the fish; on the percentage yields of fillet, head, frame, viscera, skin, and scales; and on the moisture, protein, oil, and ash contents of those component parts.

Results.--Results obtained from the study of the seasonal differences in physical measurements and chemical composition of four species of Middle Atlantic fish indicated that sea bass, flounder, and fluke caught in the summer were larger than those from the spring catch. The mean size of scup from the spring catch, however, was larger than that of fish from the summer catch. Seasonal changes in yield of component parts were not proportional to changes in the size of the fish. Important differences noted in chemical composition included significantly higher oil content coupled with lower moisture content for summer-caught sea bass, flounder, and fluke and spring-caught scup as compared with spring-caught sea bass, flounder, and fluke, and summer-caught scup.

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essence, the survival curve was the inverse of the normal growth curve. The survival of *E. coli* in sea water varied inversely with temperature and the results confirm previous reports that low temperatures favor the survival of bacteria in sea water.

Plating procedure.--As a result of their studies, the authors adopted the following procedure to evaluate the influence of various physical, chemical, and biological factors on the survival of cells of *E. coli* in sea water.

Inocula were prepared by suspending 18- to 24-hour-old nutrient-lactose slant cultures of *E. coli* in sterile tap water. The cells were collected by centrifugation and washed three times. The final cell suspension was adjusted with sterile water to an optical density equal to a cell concentration of 10⁸ per ml. One ml. of this suspension was added to 100 ml. of freshly collected sea water in a sterile 250-ml. Erlenmeyer flask, yielding a final concentration of approximately 10⁶ cells of *E. coli* per ml. The water was swirled manually to insure uniform distribution of the inoculum. An aliquot was then taken and appropriate dilutions plated to determine the initial number of cells. The flasks were incubated at 28°C. without agitation and plated periodically. In the plating procedure approximately 10 ml. of Tergitol 7 agar was poured into each plate and allowed to solidify. The surface of the agar of a series of plates was inoculated with 0.1 ml. of various dilutions of the sample being tested and the inoculum was distributed over the agar surface by tilting and rotating the plates.

The mean coefficient of variation, calculated from the counts obtained on each of the six replicate plates made at each test period on each of the three samples, was found to be ± 5.2 percent. This is a measure of the amount of variation in terms of percent of the mean and served as an index of precision of the procedure. An analysis of variance of all of the data showed no statistically significant difference between the results obtained from the three separate portions of the same water sample. Therefore, when significant differences were observed in portions of the same water sample subject to various treatments it was concluded that the differences were due to treatment and not to variation inherent in the test procedure.

7. 85 AN EVALUATION OF FACTORS AFFECTING THE SURVIVAL OF <u>ESCHERICHIA COLI</u> IN SEA WATER. II., III., AND IV. Carlucci, A. F., and Pramer, David (Department of Agricultural Microbiology, Rutgers University, New Brunswick, New Jersey) Applied Microbiology 8, 247-250, 251-254, 254-256 (July 1960) II. Salinity, pH, and Nutrients Summary.--Death of cells of <u>Escherichia coli</u> was more rapid in deionized water than in 25 percent sea water, but survival of the test organism was decreased in deionized water containing sea water at concentrations greater than 25 percent. Sea water had a similar effect on cell respiration. Survival of <u>E. coli</u> was comparable in sea water and NaCl solutions of equal salinity and varied inversely with salt concentration. An acid reaction of pH 5.0 was more favorable for survival of <u>E. coli</u> in sea water than in NaCl solutions of the same reaction. The reaction and salinity of natural sea water do not favor survival of the test organism and contribute significantly to the rapid death of cells of <u>E. coli</u> that enter the oceans by way of land drainage and sewage outfalls. High levels of some inorganic nutrients, $(\text{NH}_4)_2\text{SO}_4$ and $(\text{NH}_4)_2\text{HPO}_4$ fostered survival of <u>E. coli</u>. When sea water was supplemented with organic matter (glucose, peptone, sewage volatile solids, and cysteine) death of <u>E. coli</u> was reduced and in some cases the test organism as well as the indigenous marine microflora multiplied. Studies showed that <u>E. coli</u> was not able to compete effectively for available organic matter in sea water. III. Antibiotics. Summary.--The production of antibiotics active against <u>Escherichia coli</u> or <u>Bacillus subtilis</u> was (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12, PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug	8. 0 PROXIMATE COMPOSITION OF SOUTHERN OYSTERS--FACTORS AFFECTING VARIABILITY Lee, Charles F.; Kurtzman, Caroline H.; and Pepper, Leonard (Bureau of Commercial Fisheries, College Park, Maryland) Commercial Fisheries Review 22, 1-8 (July 1960) This investigation of the composition of Southern oysters had the following objectives: (1) to provide information needed by dietitians and processors, (2) to compare the effect of different methods of processing on composition, and (3) to compare the composition of oysters from a number of different states and growing areas. Experimental.--Fifty-one pairs of samples of raw shucked oysters were collected from plants in Georgia, South Carolina, and in the Gulf Coast States in an extension of an earlier study of the proximate composition of oysters. From each plant, unwashed shell oysters and washed plant oysters were obtained. The moisture, protein, fat, ash, total chloride, and carbohydrate content were determined for each sample. Conclusions.--1. The total solids, carbohydrate, and fat contents of the oyster show a seasonal pattern of fluctuation, from high values in the late spring just prior to spawning to low values during the fall just before cooler waters stimulate new growth. 2. The salt and ash contents are related primarily to water salinity, which is influenced by rainfall and other environmental factors that vary for each oyster bed. In the 2 years from October 1954 to October 1956, oysters taken in the fall had higher salinity than those taken in the spring or the summer. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12, PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug
7. 89 THE PICRIC ACID TURBIDITY TEST: A POSSIBLE PRACTICAL FRESHNESS TEST FOR ICED SHRIMP Kurtzman, Caroline H. and Snyder, Donald G. (Bureau of Commercial Fisheries, College Park, Maryland) Food Technology 14, 337-342 (July 1960) Introduction.--A possible satisfactory freshness test for iced shrimp was discovered by chance during a preparatory procedure for an analysis of the free amino acids of spoiled and unspoiled shrimp. The procedure is based on the precipitation of shrimp protein from solution with 75 percent ethanol and then by the application of heat after which a clear supernatant is obtained by centrifugation. Saturated aqueous, picric acid solution is then added to the clear supernatant. The turbidity that results is used as an indication of the amount of free amino acids that are present. The authors found that unspoiled shrimp yielded clear supernatants, whereas spoiled shrimp yielded turbid supernatants when the picric acid solution was added. A satisfactory freshness test for iced shrimp is not presently available as existing tests either indicate spoilage after the shrimp are obviously spoiled or they detect constituents that disappear during the early stages of spoilage. In the preparatory procedure for free amino acid analyses, the authors found a clear-cut difference in response that may be of use in distinguishing spoiled and unspoiled shrimp. The development and evaluation of a procedure that is called the picric-acid turbidity test is described in the present report. Preliminary studies.--In an effort to simplify the test the authors reduced the time required to conduct the procedure from several hours to about 15 minutes by (a) utilizing a mechanical blender, (b) eliminating the use of heat, and (c) filtering the slurry through paper designed for large particle (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12, PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Richard W. Nelson	8. 59 OSMOTIC PRESSURE AND AQUEOUS HUMOR FORMATION IN DOGFISH Doolittle, Russell F.; Thomas, Cynthia; and Stone, William, Jr. (Marine Biological Laboratories, Woods Hole, Massachusetts, and Ophthalmic Plastics Laboratory, Massachusetts Eye and Ear Infirmary, Boston) Science 132, 36-37 (July 1960) Introduction.--As is well known, elasmobranch fishes retain huge quantities of urea and trimethylamine oxide in their plasma, which elevates the osmotic pressure of the plasma above that of sea water. The study reported here was undertaken to determine the distribution ratios of these substances, since a ratio of less than 1 would result in a potentially large osmotic pressure difference between the blood plasma and the aqueous humor. For this reason, it was thought that the operative mechanisms in the elaboration of aqueous humor might be exaggerated in these fishes to compensate for the lesser osmotic contribution of urea and trimethylamine oxide in their aqueous humor. Findings.--The results of chemical and physical analyses on the aqueous humor and plasma of 90 smooth dogfish are reported. Urea and trimethylamine oxide reach steady-state distribution ratios of 0.93 and 0.88, respectively; and the combined deficit (plasma concentration-aqueous concentration) is approximately 34 millimoles per kilogram of water. Theoretically this could represent a difference in osmotic pressure of about 580 millimeters of mercury. The only component of dogfish aqueous humor in great enough excess to be osmotically important is bicarbonate ion, and the distribution ratio of this ion averaged 2.5, which represents a surplus of about 9 millimoles per kilogram of water. The higher concentration of bicarbonate ion in the aqueous humor is nullified, however, by a lower chloride ion concentration; and it would appear that an exchange of these two anions occurs, as it apparently does in other carbonic anhydrase mediated systems. The pH is consistently high. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XIII, NO. 12, PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE Reprinted in part

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precipitates. Each modification was considered satisfactory if turbid filtrates were obtained with shrimp that had been stored for 11 or 12 days in ice and clear filtrates were obtained with control shrimp.

Procedure.--Peel, de vein, and weigh the shrimp on a trip balance. Macerate the sample of shrimp for about 30 seconds in a mechanical blender with a volume of 70 percent ethanol equal in weight to four times that of the sample. Add saturated aqueous picric acid solution to the slurry in the blender in an amount equal to the weight of the shrimp. Reblend the slurry for about 20 seconds. Filter the slurry immediately through the Whatman No. 41 filter paper, and collect about 10 ml. of the filtrate in a 15-ml. test tube. Measure the degree of turbidity of the filtrate with a suitable instrument. Correct for a blank prepared from a volume of water equal to the weight of the sample of shrimp to be tested and the amounts of the reagents mentioned above.

Results.--The turbidity test was used in storage studies to determine whether or not the incidence of turbidity is related to organoleptic evaluations of changes in quality. Four lots of iced shrimp were evaluated for freshness during storage periods of 1 to 19 days. In general, changes in the shrimp as indicated by the incidence of turbidity were directly related to organoleptic indications of loss of quality.

In-plant study.--Samples of iced shrimp as received at a plant and at various stages of processing were subjected to the turbidity test. Evaluations of the general quality of the shrimp were made by experienced plant personnel. The results of the turbidity evaluations were closely related to the evaluations of quality that were made by plant personnel.

7. 85

not demonstrated in tests of 200 marine bacteria. Chlortetracycline and penicillin were rapidly inactivated in both sterilized and untreated sea water, whereas no loss of chloramphenicol, neomycin, oxytetracycline, or streptomycin was observed in samples of a water that contained the antibiotics at a concentration of 200 p.p.m. and were incubated at 28°C. for 30 days. The biological effects of antibiotics in sea water varied with the nature and concentration of the antibiotic tested as well as with the process investigated. In general, antibiotics reduced the numbers of colonies developing on sea water agar and the growth in sea water broth of *E. coli* and the indigenous bacterial flora. Nitrification and thiosulfate oxidation were more sensitive to antibiotics than was ammonification. Some antibiotics added to sea water persisted for long enough periods to exert a biological effect. Nevertheless, there is no evidence that antibiotics are produced under natural conditions by marine micro-organisms and contribute to the death of cells of *E. coli* that enter the sea.

IV. Bacteriophages

Summary.--Bacteriophages active against *Escherichia coli*, *Aerobacter aerogenes*, and *Serratia maritima* were isolated from sea water without difficulty when enrichment procedures were employed. Coliphages were inactivated rapidly in natural sea water but persisted in filtered and heat-sterilized sea water. The effectiveness of coliphages was dependent on the presence in sea water of sufficient nutrient to support growth and multiplication of host cells.

8. 59 (Cross Reference: 9. 13)

Sodium ion attains a distribution ratio concordant with an estimated Donnan equilibrium. Analyses of other constituents failed to demonstrate any substance or substances in great enough surplus to balance the urea-trimethylamine oxide deficit, even though more than 98 percent of the respective dry weights were accounted for.

Freezing-point depression measurements made with a Fiske osmometer (sample size, 0.2 ml.) showed that the osmotic pressure of the aqueous humor was about 25 millimoles lower than that of plasma. This finding suggests that the passage of water from the plasma into the eye of this fish is against an osmotic gradient. The smallest difference found in 14 fish tested was 14 millimoles. The measured osmotic pressures compared favorably with those calculated from the totaled results of chemical analyses when the effect of ionic strength on activities was considered.

It seemed important to find out how similar the aqueous formation in this species is to the process in higher vertebrates. It is significant that elasmobranchs are the only fishes which possess a ciliary body. The ciliary body containing carbonic anhydrase, as it also does in mammals, and the specific inhibitor of this enzyme, acetazolamide, can lower the distribution ratio of bicarbonate ion to less than 1 when it is injected intravenously in the dogfish. We regard the fact that most of the distribution ratios of substances measured were characteristic of higher vertebrates as circumstantial evidence that the aqueous humor formation in these fishes follows a pattern similar to that in mammals.

Conclusions.--In the absence of evidence supporting either of the above two interpretations, the following tentative speculation is introduced: (1) in the dogfish, water is apparently moving from the plasma into the aqueous humor against an osmotic gradient; (2) the additional work needed for this process is reflected in the unusually high bicarbonate ion concentration in dogfish aqueous humor; and (3) carbonic anhydrase is instrumental in this process.

8. 0 Cross Reference: 1. 81)

3. As a result of loss during shucking and washing, insoluble constituents of the plant samples--that is, protein and fat--constitute a higher proportion of the remaining solids. The carbohydrate content of washed plant samples increases less than the proportional amount of soluble solids lost, indicating some loss of soluble glycogens during washing. The proportion of the original salt content that remains in the washed oysters depends on the amount of exposure to fresh water during the washing process.

4. Solids content of Southern oysters varies over a wide range, but the average of 12.6 percent for all washed oysters is comparable with that of oysters from Chesapeake Bay.

5. Oysters from all Southern States have a similar pattern of seasonal variability. Benefit to the industry would result through increased production and utilization of oysters during March through May, perhaps by use of freezing if the technical problems were solved.

1, 0117	FISHES TAKEN IN THE MENHADEN FISHERY OF ALABAMA, MISSISSIPPI AND EASTERN LOUISIANA Christmas, J. Y.; Gunter, Gordon; and Whatley, Edward C. Special Scientific Report; Fisheries No. 339, 10 pp. (April 1960) (U. S. Department of the Interior, Bureau of Commercial Fisheries, Washington 25, D. C.) 1, 0118 (Cross Reference: 1, 26) EXPLORATORY FISHING IN LAKE ERIE, SEPTEMBER 1958-NOVEMBER 1959 Sand, Reidar F. and Gordon, William G. Commercial Fisheries Review <u>22</u>, 1-12 (June 1960) Results of the explorations from the 1958-59 work in Lake Erie indicate that the abundant smelt can be taken profitably on a commercial scale with trawling gear. There is evidence that the seasonal availability and distribution is closely related to lake water temperatures within a range of 41°F. to 68°F., and with the colder mid-50-degree range of temperatures preferred. Daylight trawling for smelt appears much more promising than night fishing. Evidence to date suggests that when commercial-scale concentrations of smelt are found, they tend to be uniform in composition with few other species present.	2, 1121 STUDIES ON THE KINEMATIC BEHAVIOUR OF THE GROUND ROPE OF THE TRAWL NET II. Suzuki, Otohiko and Kawakami, Tasee Bulletin of the Japanese Society of Scientific Fisheries <u>26</u>, 204-206 (March 1960) (English abstract) This paper is concerned with a study of the kinematic behaviour of the sweeping rope of the trawl net in the second duration of the transient process from the arrival of the deformation at the wing tip to the movement of the whole net.
2, 02 (Cross Reference: 8, 59)	STUDIES ON THE INFLUENCE OF TREATMENTS IMMEDIATELY AFTER CATCHING UPON THE QUALITY OF FISH FLESH V. DETERMINATION OF LACTIC ACID IN FISH MUSCLE Tsuchiya, Yasuhiko and Kuniti, Kiyoshi Bulletin of the Japanese Society of Scientific Fisheries <u>26</u>, 284-288 (March 1960) (English abstract) The amount of lactic acid found was in the range of 283 to 1,170 milligrams percent in the red muscles of bonito, tunny, sardine; 283 to 639 milligrams percent in the medium red muscle in Clupanodon punctatus, Lateolabrax japonicus, and carp; and 94 to 185 milligrams percent in the white muscle of codfish and flatfish.	2, 1121 EQUIPMENT NOTE NO. 4. -- A METHOD OF MAKING ELECTRICAL TRAWL CABLE TERMINATIONS AND CONNECTIONS McNeely, Richard L. (Branch of Exploratory Fishing, Division of Industrial Research, Bureau of Commercial Fisheries, Seattle 2, Washington) Commercial Fisheries Review <u>22</u>, 15-19 (June 1960) Marine scientists increasingly are becoming more interested in the use of electrical cables that can tow fishing gear and sampling devices and transmit measurements of (1) performance characteristics, and (2) physical properties of the water masses through which the devices pass. Detailed descriptions of methods of making cable terminations and connections have been requested frequently. This article, consisting mainly of photographs, was prepared to answer these requests. It describes and illustrates workshop techniques and materials tested and found reasonably reliable as a result of use aboard the Bureau's exploratory fishing and gear research vessel John N. Cobb.
2, 02	ENZYMATIC STUDIES ON THE MUSCLE OF AQUATIC ANIMALS II. AEROBIC GLYCOLYSIS OF FISH AND MOLLUSK MUSCLE Shibata, Takeshi and Yoshimura, Katsuji Bulletin of the Japanese Society of Scientific Fisheries <u>26</u>, 294-299 (March 1960)	2, 40 THE ROLE OF HOLDING POUNDS IN THE MAINE LOBSTER INDUSTRY Dow, Robert L.; Harriman, Donald M.; and Scattergood, Leslie W. Commercial Fisheries Review <u>21</u>, 1-14 (May 1959) (Abstract of this article appears under 1, 87 page 1 - October 1959)
		2, 40 CHANGES IN OCEAN FISH DURING STORAGE IN SALINE SOLUTIONS Kleimenov, I. Ya.; Uspenskaya, Z. P.; and Lebedeva, T. M. Chemical Abstracts <u>54</u>, 15749c (August 10, 1960)

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name	Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring	<i>Pomolobus pseudoharengus</i>	Menhaden	Mosbunker, pogey, fatback	<i>Brevortia</i> species
	Blueback, glut herring, shad herring	<i>Pomolobus aestivalis</i>	Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Anchovy		<i>Engraulis mordax</i>	Ocean perch:	Rosefish, redfish, red perch	<i>Sebastes marinus</i> <i>Sebastes alutus</i>
Cod	Codfish	<i>Gadus morhua</i> (Atlantic) <i>Gadus macrocephalus</i> (Pacific)	Pilchard	Sardine	<i>Sardinops caerulea</i>
Flounder:		<i>Glyptocephalus cynoglossus</i>	Pollock	Boston bluefish	<i>Pollachius virens</i>
Gray sole		<i>Pseudopleuronectes dignabilis</i>	Rockfish	Rock cod, snapper	<i>Sebastes</i> species (Pacific)
Lemon sole	Dab	<i>Limanda ferruginea</i>	Sablefish	Black cod	<i>Anoplopoma fimbria</i>
Yellowtail	Sea dab	<i>Hippoglossoides platessoides</i>	Salmon:		
Blackback	Winter flounder	<i>Pseudopleuronectes americanus</i>	Atlantic		<i>Salmo salar</i> (Atlantic)
Fluke	Summer flounder, gulf flounder, flounder	<i>Paralichthys species</i>	Pacific:		<i>Oncorhynchus tshawytscha</i> <i>Oncorhynchus keta</i> <i>Oncorhynchus gorbuscha</i> <i>Oncorhynchus nerka</i> <i>Oncorhynchus kisutch</i>
'Sole'		<i>Pleuronectidae</i> and <i>Bothidae</i> species	Chinook or king	Tyee, spring	
'California halibut'		<i>Paralichthys californicus</i>	Chum or keta	Fall, dog	
Haddock		<i>Melanogrammus aeglefinus</i>	Pink	Humpback	
Halibut		<i>Hippoglossus hippoglossus</i> (Atlantic) <i>Hippoglossus stenolepis</i> (Pacific)	Red or sockeye	Blueback	
Herring:			Silver or coho		<i>Scomberomorus maculatus</i>
Lake	Herring	<i>Leucichthys artedii</i> (Great Lakes, except Erie)	Spanish mackerel	Mackerel	
Round		<i>Etrumeus sadina</i>	Tuna and tunalike fishes:		
Sea		<i>Clupea harengus</i> (Atlantic) <i>Clupea pallasii</i> (Pacific)	Albacore	Longfin tuna	<i>Germo alalunga</i>
Thread		<i>Opisthonema oglinum</i>	Bluefin	---	<i>Thunnus saliens</i> <i>Thunnus thynnus</i> <i>Thunnus secundodorsalis</i>
Jack mackerel	Horse mackerel	<i>Trachurus symmetricus</i>	Bonito	Bonito, albacore, false albacore	<i>Sarda sarda</i> (Atlantic) <i>Sarda chiliensis</i> (Pacific)
Lingcod	Cultus cod, blue cod, buffalo cod, ling	<i>Ophiodon elongatus</i>	Little	Striped tuna	<i>Euthynnus alletteratus</i> <i>Katsuwonus pelamis</i> <i>Neothunnus macropterus</i>
Mackerel		<i>Scomber scombrus</i> (Atlantic) <i>Pneumatophorus diego</i> (Pacific)	Skipjack		
			Yellowfin	Silver hake	<i>Merluccius bilinearis</i>
Crab:			Whiting		
Blue			Clam:		<i>Cardium corbis</i> (Pacific)
Hard	Hard-shelled crab	<i>Callinectes sapidus</i>	Cockle	Pompano shells	<i>Donax variabilis</i>
Soft and peelers	Soft-shell crab	<i>Callinectes sapidus</i>	Coquina	Butter	<i>Saxidomus nuttallii</i> (Pacific)
Dungeness		<i>Cancer magister</i>	Hard	Little neck	<i>Papua staminea</i> (Pacific)
King	Alaska king crab	<i>Paralithodes camtschatica</i>		Round clam, cherrystone, quahog, little neck	<i>Venus mercenaria</i> (Atlantic) <i>Venus mortoni</i> (Florida)
Rock		<i>Cancer irroratus</i> (New England)	Ocean quahog		<i>Cyprina islandica</i>
Stone		<i>Menippe mercenaria</i>	Pismo		<i>Tivela stultorum</i> (Pacific)
Lobster:			Razor		<i>Ensis species</i> (Atlantic)
Northern		<i>Homarus americanus</i> (Atlantic)	Soft	Soft-shell clam, sand clam, mannyose, mantnose	<i>Siliqua patula</i> (Pacific)
Spiny	Sea crawfish, rock lobster	<i>Panulirus argus</i> (Atlantic) <i>Panulirus interruptus</i> (Pacific)	Surf	Skimmer	<i>Mya arenaria</i> <i>Spisula solidissima</i>
Shrimp		<i>Penaeus setiferus</i> (South)	Oyster:		
		<i>Penaeus duorarum</i> (Atlantic)	Eastern	Cove	<i>Crassostrea virginica</i>
		<i>Penaeus aztecus</i> and Gulf	Pacific (introduced)	Japanese	<i>Crassostrea gigas</i>
	Prawn	<i>Xiphopenaeus kroyeri</i>	Western	Olympia, native	<i>Ostrea lurida</i>
		<i>Pandalus species</i> (Atlantic and Pacific)	Scallop:		
		<i>Pandalopsis species</i> (Pacific)	Bay		<i>Pecten irradians</i> (Atlantic)
		<i>Crago species</i> (Pacific)	Sea		<i>Pecten aquiculatus</i> (Pacific) <i>Pecten magellanicus</i>

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

3. 12 IMPROVEMENT OF QUALITY OF YELLOWFIN BY CHLORTETRACYCLINE (CTC) TREATMENT ABOARD SHIP AND CTC RESIDUE OF TISSUES BEFORE AND AFTER BOILING Yone, Yasuo and Tomiyama, Teisuo Bulletin of the Japanese Society of Scientific Fisheries <u>26</u>, 49-54 (January 1960) (English abstract) Freshness was the best in fish that had been stored in ice after being either held in 10 p.p.m. of CTC in sea water for 1 to 4 hours or brushed with 10 or 100 p.p.m. of CTC in sea water. Fish that had been stored in CTC ice was second best in freshness.	4. 11 THE C¹⁶ POLYENOIC ACIDS FROM HERRING OIL Klenk, E. and Steinbach, H. (Univ. Cologne, Ger.) Chemical Abstracts <u>54</u>, 71861 (March 25, 1960)
3. 12 CHEMICAL METHOD FOR DETERMINATION OF CHLORTETRACYCLINE II. A PRACTICAL FIELD ASSAY METHOD Tomiyama, Teisuo; Yone, Yasuo; and Kitahara, Keiko Bulletin of the Japanese Society of Scientific Fisheries <u>26</u>, 55-59 (January 1960) (English abstract) The present paper deals with development of a practical fluorometric method for the determination of chlortetracycline and with the reliability of the fluorometric method for chlortetracycline assay in ice as compared with several chemical and microbiological assay methods.	4. 11 A CRITICAL STUDY OF THE OXIDATION METHODS FOR THE DETERMINATION OF GLYCERIDE COMPOSITION OF FATS Lakshminarayana, Gollamudi and Rebello, Damascene (Department of Chemical Technology, University of Bombay, Bombay, India) Journal of the American Oil Chemists' Society <u>37</u>, 274-281 (June 1960) A critical evaluation of the individual steps in Hilditch's acetone-permanganate and Kartha's acetone-acetic acid-permanganate oxidation methods for the determination of the glyceride type of composition of fats was carried out in order to examine the limitations of these methods.
3. 239 MYOFIBRILLAR PROTEINS FROM THAWED MUSCLES Azzone, Giovanni Felice; Carasoli, Ernesto; and Muscatello, Umberto (Univ. Modena, Italy) Chemical Abstracts <u>53</u>, 4387b (March 10, 1959)	4. 11 DETERMINATION OF CHOLESTEROL IN FISH MEAT WITH SAPONIN Yamazoe, Yoshitaka (Nagasaki Ship-Building Junior Coll.) Chemical Abstracts <u>54</u>, 16686b (August 25, 1960)
3. 239 ELECTROPHORETIC ANALYSIS OF FLUIDS OBTAINED FROM MECHANICALLY DISRUPTED AND FROZEN FISH MUSCLE Seagran, Harry L. Food Research <u>24</u>, 681-687 (November-December 1959) (Abstract of this article appears under 7. 89 page 15 - April 1960)	4. 19 EGG LIPIDS OF A CARP, <u>CYPRINUS CARPIO</u> I. FATTY OIL FROM CARP EGG Igarashi, Hisanao; Zama, Koichi; and Katada, Muneo Bulletin of the Japanese Society of Scientific Fisheries <u>26</u>, 328-329 (March 1960) (English abstract) Fatty oil was obtained as an acetone-soluble fraction from the lipids of carp egg. The composition of acids of the fatty oil were peculiar to the depot fat of fresh-water fishes. η-C₁₈ alcohols, C₂₁ glyceryl ethers, and cholesterol were found in the unsaponifiable matter.
	4. 19 YIELDS OF CHOLESTEROL FROM VARIOUS SOURCES Erdős, Jose and Alatriste, Manuel (Natl. School Biol.-Sci., Mexico, D. F.) Chemical Abstracts <u>54</u>, 3555b (March 10, 1960)

CONVERSION UNITS

1 pound	= 453.59 grams
1 ounce	= 28.350 grams
1 inch	= 2,5400 centimeters
1 gallon	= 128 ounces
1 gallon	= 231 cubic inches
1 quart	= 0.9463 liters
1 ounce	= 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$$F = 9/5 C + 32$$

$$C = 5/9 (F - 32)$$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B. t. u. per pound per ° F. above freezing and 0.40 B. t. u. per pound per ° F. below freezing.

An average heat of fusion generally used for fishery products is 115 B. t. u. per pound. The heat of fusion of ice is 144 B. t. u. per pound.

DEFINITIONS

calorie	.....	heat required to raise the temperature of 1 gram of water 1 degree Centigrade
British thermal unit	.....	252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit
ton of refrigeration	.....	removal of heat at the rate of 12,000 B. t. u. per hour
atmospheric pressure	 a	
normal	.....	a pressure at sea level of 14.696 pounds per square inch, absolute
sensible heat	.....	heat added to the body when its temperature is changed
latent heat	.....	heat absorbed or evolved during a change of state, with no change of temperature
heat of fusion	.....	heat absorbed when a solid melts, with no change of temperature
heat of vaporization	.....	heat absorbed when a liquid vaporizes, with no change of temperature
heat of reaction	.....	heat evolved or absorbed during a chemical reaction
heat transmission	.....	flow of heat by conduction, convection, or radiation, singly or in any combination
horsepower	.....	work performed at the rate of 550 foot pounds per second
mechanical equivalent of 1 B. t. u. of heat	.....	heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Angstrom unit(s)	ma.	milliampere(s)
a. c.	alternating current	Mc.	megacycle
alc.	alcohol, alcoholic	mc.	millicurie
alk.	alkaline (not alkali)	Me	methyl (MeOH, methanol)
amp.	ampere(s)	meq.	milliequivalent
anhyd.	anhydrous	m. e. v.	million electron volts
aq.	aqueous	mg.	milligram(s)
at.	atomic (not atom)	ml.	milliliter(s)
at. wt.	atomic weight	mm.	millimeter(s)
Bé.	Baumé	mμ	millimicron(s)
biol.	biological	mol.	molecule, molecular
B. O. D.	biochemical oxygen demand	mol. wt.	molecular weight
b. p.	boiling point	m. p.	melting point
B. t. u.	British thermal unit(s)	μ	micron(s)
cal.	calorie(s)	mv.	millivolt(s)
ce.	cubic centimeter(s)	n	index of refraction (n_D^{20} for 20° and sodium light)
cm.	centimeter(s)	N	normal (as applied to concn.)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d_{20}^{20} , at 20° referred to water at the same temperature)	petr. ether	petroleum ether
d. c.	direct current	p. p. m.	parts per million
e. m. f.	electromotive force	ppt.	precipitate
Et	ethyl (Et ₂ O, ethyl ether)	pptd.	precipitated
e. v.	electron volt(s)	pptg.	precipitating
f. p.	freezing point	pptn.	precipitation
ft.	foot, feet	qual.	qualitative (not qualitatively)
g.	gram(s)	quant.	quantitative (not quantitatively)
γ	microgram(s)	r. p. m.	revolutions per minute
hr.	hour	sol.	soluble
in.	inch(es)	soln.	solution
kcal.	kilocalorie(s)	sp. gr.	specific gravity
kg.	kilogram(s)	sp. heat	specific heat
kv.	kilovolt(s)	sp. vol.	specific volume
kv. -amp.	kilovolt-ampere(s)	sq. cm.	square centimeter(s)
kw.	kilowatt(s)	U. S. P.	United States Pharmacopeia
kw. -hr.	kilowatt-hour	v.	volt(s)
l.	liter(s)	vol.	volume (not volatile)
lb.	pound(s)	w.	watt(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at	wt.	weight
M.	molar (as applied to concn.)		

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

4.29	PREPARATION OF LONG CHAIN ALKYL HYDROPEROXIDES Wawzonek, S.; Klimstra, P. D.; and Kallio, R. E. (Department of Chemistry and Bacteriology, State University of Iowa, Iowa City) Journal of Organic Chemistry 25, 621-623 (April 1960) Dodecyl, tetradecyl, hexadecyl, and octadecyl hydroperoxides have been prepared for testing as intermediates in the biological oxidation of saturated hydrocarbons. The hydroperoxides were prepared in a state of purity varying from 92 to 100 percent by the alkylation of hydrogen peroxide in basic medium with the corresponding alkyl methanesulfonate.	4.40	COMPARATIVE FEEDING VALUE OF COMMON EDIBLE FATS AS MEASURED BY THE GROWTH OF PREMATURELY WEANED PUPS, GUINEA PIGS AND SWINE Crampton, E. W.; Shaw, R. K.; MacKay, V. G.; and Schad, Donna C. (Department of Nutrition, MacDonald College (McGill University, Quebec, Can.) Journal of Nutrition 70, 81-90 (January 1960) In an experiment utilizing 108 puppies, 172 pigs, and 266 guinea pigs weaned at 10, 14, and 3 days of age, respectively, butterfat was evaluated against a low-fat control diet and against 15 other edible animal and vegetable fats and oils fed as 20 percent by weight of the ration. The chief criteria of value was growth, voluntary feed intake, apparent digestibility, and gain per 1,000 digested Calories. No significant differences of importance could be established between corn, linseed, rapeseed, fish, soybean, cottonseed, and coconut oils (the latter four oils in the hydrogenated form) lard, mixed tallow, and beef tallow.
4.29	THE OZONIZATION OF METHYL OLEATE Pryde, E. H.; Anders, D. E.; Teeter, H. M.; and Cowan, J. C. (Northern Regional Research Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Peoria, Illinois) Journal of Organic Chemistry 25, 618-621 (April 1960) The effect of solvent on the ozonization of methyl oleate and on the reductive decomposition of the ozonolysis products has been studied. The use of a reactive solvent such as methanol or acetic acid resulted in isolated product yields of 87 percent. Carbonyl yields before isolation of product were on the order of 90 to 92 percent. The use of a nonreactive solvent such as ethyl acetate or heptane resulted in a low yield and impure products. The results are explained on the basis of the Criegee zwitterion mechanism for ozonization.	4.90	THE EFFECT OF VARIOUS DIETARY FATS, ESPECIALLY BUTTER AND SOME MARGARINES ON BLOOD CHOLESTEROL IN RATS Funch, J. P.; Nielsen, E.; and Dam, H. (Polytechnic Inst., Copenhagen) Chemical Abstracts 54, 16572c (August 25, 1960)
4.5	VOLATILE SUBSTANCES FORMED BY THE AIR OXIDATION OF THE METHYL ESTER OF HIGHLY UNSATURATED ACIDS Toyama, Yoshiyuki and Matsumoto, Iwao Memoirs of the Faculty of Engineering, Nagoya University 5, 335-338 (September 1953) The methyl ester of highly unsaturated acids prepared from sardine oil has been air-oxidized at 45° to 55°C. Among the volatile oxidation products that have been identified are formic, acetic, butyric, and heptanoic (or caproic) acids, acetaldehyde, butyric aldehyde, and heptanol. The presence of some carbonyl compounds, possibly unsaturated carbonyl compounds, yielding unstable 2,4-dinitrophenylhydrazones also have been indicated.	6.136	AZEOTROPIC SEPARATIONS Coates, Jesse (Louisiana State University, Baton Rouge) Chemical Engineering 67, 121-128 (May 16, 1960) Azeotropic and extractive distillation find their principal use in the separation of mixtures whose components boil too close together for economical, simple fractional distillation. In both azeotropic and extractive distillation, a substance not normally present in the mixture is added to effect a separation by increasing the relative volatility of the components most difficult to separate.
4.5	(Cross Reference: 4.61) THE γ -RADIATION OIL DETERIORATION OF MARINE PRODUCTS AND ITS PREVENTION (PRELIMINARY WORK) Toyama, Kenzo; Hirano, Toshiyuki; and Yamaga, Hiroshi Bulletin of the Japanese Society of Scientific Fisheries 25, 565-568 (November 1959) (English abstract) During irradiation, oil oxidation in salted and dried saurels, which contain 68 to 70 percent moisture, can be substantially avoided whether an antioxidant is present or not if the saurels are packed in evacuated polyethylene bags. Butylated hydroxyanisole hindered not only the accumulation of peroxide oxygen of the saurels prior to irradiation but also oil oxidation under radiation. Application of smoke odor from an electro-smoke solution was fairly effective in neutralizing the offensive odor caused by irradiation.	6.137	RECENT PROGRESS IN THE CONTINUOUS REFINING OF FATTY OILS Braae, B. (Aktiebolaget Separator, Stockholm, Sweden) Chemistry and Industry No. 36, 1152-1160 (September 6, 1958) 6.137 RECOVERY OF STEROLS AND VITAMINS FROM FATS AND OILS Notevarg, Olav; Roald, Arvid; and Sletnes, Per Chemical Abstracts 54, 15970a (August 10, 1960)

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6.38	ENZYMIC ACTION ON PIGMENT FORMATION IN SPONGES (ALPYSINA AEROPHOBIA) Christomanos, Anastasias A. (Lab. Marine Biochem., St. George, Greece) Chemical Abstracts <u>54</u> , 763a (January 10, 1960)	7.80	A METHOD FOR SCREENING FLAVOR PANEL MEMBERS AND ITS APPLICATION TO A TWO SAMPLE DIFFERENCE TEST Hall, Barbara A.; Tarver, Mae-Goodwin; and McDonald, Joan G. (Continental Can Company, Inc., Chicago 2, Illinois) Food Technology <u>13</u> , 699-703 (December 1959) Screening and flavor test methods described in this paper were developed to evaluate experimental container materials for canned beer. Potential flavor panel members were screened for sensitivity, or tolerance to bitterness since this taste was considered a major component of beer flavor.
6.38	SPONGES Galtsoff, Paul S. (Woods Hole, Massachusetts) Fishery Leaflet <u>480</u> , 11 pp. (March 1960) (U. S. Department of the Interior, Bureau of Commercial Fisheries, Washington 25, D. C.)	7.80	EVALUATION OF INOSINIC ACID AND FREE AMINO ACIDS AS TASTING SUBSTANCES IN THE KATSUWOBUISHI STOCK Konosu, Shoji; Maeda, Yasuhiko; and Fujita, Takao Bulletin of the Japanese Society of Scientific Fisheries <u>26</u> , 45-48 (January 1960) (English abstract) The combination of inosinic acid and amino acids is judged to be more delicious than inosinic acid alone and to provide a distinct meaty flavor fairly similar to that of the original stock. The amino acids, on the other hand, are almost tasteless in the concentration tested, but they clearly exert an enhancing effect on the taste of inosinic acid.
7.591	PREPARATION OF CRYSTALLINE CYTOCHROME FROM PORPHYRA TENERA Yakushiji, Eihiro and Sugimura, Yasutomo (Toho University, Narashino, Chiba, Japan); and Sekuzu, Ichiro; Morikawa, Ichiro; and Okumaki, Kazuo (University of Osaka, Osaka, Japan) Nature <u>184</u> , 105-106 (January 9, 1960) The authors have crystallized the cytochrome by means of a cation-exchanger at pH 5.0. The method can be used to purify not only basic enzyme proteins, but also proteins that are stable in acidic pH.	7.80	HOW TO CONDUCT CONSUMER TASTE PANELS FOR FF Hansen, Wayne P. (Market Research Specialist, Morton Grove, Illinois) Quick Frozen Foods <u>22</u> , 38-39, 155-156 (February 1960)
7.591	CATALASE DETERMINATION FOR THE EVALUATION OF FISH MEAL Neugebauer, Benno Chemical Abstracts <u>54</u> , 7921g (April 25, 1960)	8.40	SOLUTE AND WATER BALANCE IN THE MUSCLE FIBERS OF THE EAST AFRICAN FRESHWATER CRAB, <u>POTAMON Niloticus</u> Shaw, J. (King's Coll., Newcastle-upon-Tyne, England) Chemical Abstracts <u>53</u> , 22544b (November 25, 1959)
7.591	LINGCOD MUSCLE PHOSPHOMONOESTERASES I. ACID PHOSPHATASES THAT HYDROLYZE p-NITROPHENYL PHOSPHATE Tomlinson, Neil and Warren, R. A. J. Canadian Journal of Biochemistry and Physiology <u>38</u> , 605-612 (June 1960) (Abstract of this article appears under 8.59 page 15 - September 1960)	8.40	THE COMPOSITION OF THE BLOOD OF THE SHORE CRAB, <u>CARCINUS MAENAS</u> , IN RELATION TO SEX AND BODY SIZE. I. BLOOD CONDUCTIVITY AND FREEZING-POINT DEPRESSIONS Gilbert, A. B. (Univ. Durham, Newcastle-upon-Tyne, England) Chemical Abstracts <u>53</u> , 22543i (November 25, 1959)

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